JUNE 22, 1944

American Machinist

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Working With Quenching Fluids

A 12-PAGE SPECIAL SECTION FOR PRODUCTION EXECUTIVES

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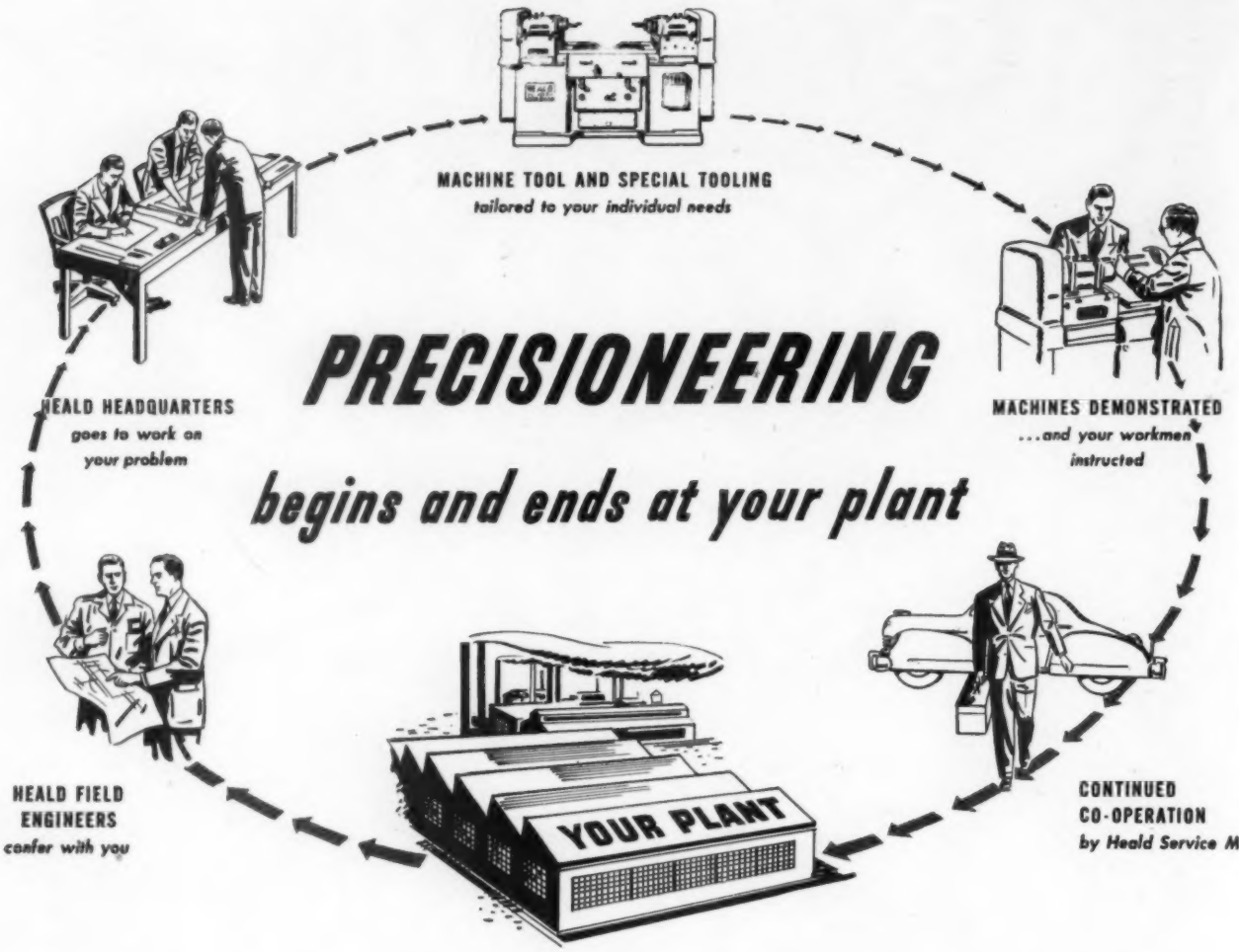
How Can Machine Tools Be Improved?

•

A Quick Way to Evaluate Steels



..to help solve your production problems—now and post-war

You are planning a post-war product, or have a current problem. Costs must be low, production fast, precision limits accurately met.

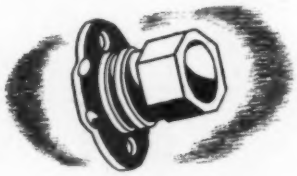
You put the problem up to a Heald field engineer. Here, briefly, is how Heald Precisioneering goes to work.

From a group of 250 Headquarters Engineers, those with thorough knowledge of your field are selected. Every requirement of your problem is considered. Special tooling is designed to facilitate each type of machining operation. The Heald Precision Machine plus tailor-made tooling built through this "thinking-it-out" process is then proven in our testing division before shipment.

In your plant, the machine is set up, demonstrated, and your workmen instructed to get the most out of it. And if future problems occur, a phone call brings back a Heald Field Service Man... puts your Heald back on the job at peak production.

To turn out products faster, to achieve greater precision, to cut costs... let Heald Precisioneering help.

THE HEALD MACHINE CO.
WORCESTER 6, MASS.



PRECISION TURNING
AUTOMOTIVE DISTRIBUTOR CAMS

With a high rate of production required, and tolerances limited to .0005, there was a need for Heald Precisioneering. Solution: on a Heald No. 48A Bore-Matic the shoulder was turned to .8740 O.D.—two at a time. Resulting production was four times greater than that turned out on a bench lathe.

HEALD *for more Precision ... Faster!*

Internal and Surface Grinding Machines • Bore-Matic Precision Finishing Machines

TECHNOLOGY DEPT

American Machinist

June 22, 1944

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From _____

_____

To _____

_____

Signed _____ _____

American Machinist Chips

Idea Mart . . . Ryan Aeronautical Company has set up a Patent Department and is establishing a liberal patent plan under which employees can receive a regular income for patentable inventions which can be marketed.

Stressing the need for new ideas to keep any business enterprise ahead of competition, the company points out that individuals with "ideas" usually have a hard row to hoe in translating their ideas into a patentable, protected invention.

Under the Ryan Patent Plan, employees may submit ideas and inventions to the company's experienced department which will, wherever possible, assist in obtaining patents, endeavor to license the invention and pay the employee by sharing in the royalties collected from licensing or in the proceeds of the sale of the patents.

This seems like a good idea for unearthing possibilities for new products—as well as a good way to cement employee relations. We thought some of our readers might want to consider this plan for their own use.

Toeing the Mark . . . One large oil company has a complete line of competitively priced cutting oils and industrial lubricants ready to spring in post-war . . . when Metal-Working plants start footing their own bills instead of passing them along to Uncle Sam.

"Don't Wake Me Up" Department . . . Lamson & Sessions has a worker who is the foreman's Dream Man. Rob Matiukas has worked on a tapper for some 20 years. He likes his old machine and doesn't want to exchange it for a new one. Likes his boss, his work, his wages and his bachelor life. (*P.S.—He hopes to come through leap year unscathed.*)

Welded Stainless Plane . . . Of interest to many in Metal-Working is the new cargo transport plane being built by Edward G. Budd Mfg. Co. for the Army and Navy. It is the first large craft of stainless steel put into full production. Unconventional design includes welded construction. Payload is 10,400 lbs., length 68 ft., span 100 ft., cruising speed 165 mph.

A War Ago This Month . . . We are indebted to Emil Erbe of Detroit for a poem he had saved from the June 6, 1918 issue of *American Machinist*. Change the word "Kaiser" to "Hitler" in the verse below and you'll have a sample of today's home front objective:

FILL UP THE GAPS

By Berton Braley

There are no hours to a soldier's job:
He can't "lay off" when he wants a rest;
He must fight on where the cannon throb
And hold the line when it meets the test.
And we who labor to crush the foe
Must mend our ranks in the shop or mine;
Make this the slogan for high and low—
"Fill up the gaps in the working line!"

The idle lathe and the idle drill
Are spots that weaken the line of war—
Dangerous breaks in the ranks of skill
Imperiling all that we're fighting for.
We've each enlisted to see it through;
We mustn't slack and we mustn't pine;
Let's do our duty as soldiers do—
"Fill up the gaps in the working line!"

For every moment the workers lose
The fighters suffer; and we must strive
To back them up with our brains and thews
And do our part in the mighty drive.
Let's see that never a task's delayed;
Let's stick on the job—your job and mine—
The man who loafs is the Kaiser's aid—
"Fill up the gaps in the working line!"

Excuse, Please . . . We are sorry to announce that the reprint situation on "The Tools of Our Trade" series is a little spotty. You may recall that these were special sections which appeared in *American Machinist*, and which furnished basic shop know-how for use in training new employees. We have distributed over 100,000 of these to plants throughout the country.

Our supply is completely exhausted on the first in the series, "The Tools of Our Trade." This featured hand tools and similar equipment. We are also out of "How to Run an Engine Lathe." Still in stock and going strong are the following:

How to Run a Drilling Machine
How to Run a Milling Machine
How to Run a Grinding Machine

If you need additional copies of these subjects, they may be obtained right away at the customary 10c each.

Choo Choo, Baby . . . The American Locomotive Company has on its books orders for several hundred steam locomotives for Russia, which may be increased substantially in the future. The company estimates there are more than 204,000 locomotives in use in major countries and that 15% or about 30,000 will have to be replaced after the war.

Construction Machinery . . . Builders of construction machinery are now operating at the highest rate by far in their history, according to the U. S. Dept. of Labor. This division of Metal-Working can replace obsolete and badly deteriorated units, and produce an ample stock of repair parts for units in basically good condition, within a very few months after the green light is given for civilian production.

Yum, Yum . . . *Speedi-Dri Spotlight* has favored us with another of its sprightly issues. Among the items we find that representatives handling Speedi-Dri compound—which dries, deodorizes and prevents rust—have a dramatic demonstration showing how harmless it is. They sprinkle a few grains on their tongues and then swallow.

We wonder if it has—like almost everything else advertised today—that "malty-rich, sweet-as-a-nut" flavor?

BEVEL GEAR DRIVES — TO *Victory*

Gleason-cut spiral bevel gear drives
. . . for earth moving equipment

CLEARING THE WAY TO VICTORY

In the face of shell-fire and dive bombing, American earth-moving machines and the intrepid men who operate them are truly setting the pace of the Allied advance toward victory. Whether on Kwajalein or at Cassino, these husky units quickly build airfields and roads so that our mechanized equipment can function.

The efficiency of these machines . . . their ability to move heavy loads over rough terrain and steep grades with the power of a tractor and the speed of a truck, is a tribute to American engineering and production skill.

DURABLE POWER TRANSMISSION PROVIDED BY SPIRAL BEVEL GEARS

Spiral bevel gears furnish the means of transmitting smoothly the driving power for these machines as it makes a right-angle turn from the motor and transmission into the wheel units. These gears have met the test — standing up under the heavy and shock loading which is characteristic of the rigorous conditions under which these machines operate.

CUT ON GLEASON MACHINES

Both pinions and gears are produced with great accuracy and in amazing quantities on the No. 26 Machines, aided by essential Gleason auxiliary equipment.

This is just one of many illustrations of the part spiral bevel gears play in providing high standards of performance for power driven machinery. This war-proven capability of spiral bevel points the way to new types of power transmission for the machines of tomorrow.

GLEASON WORKS

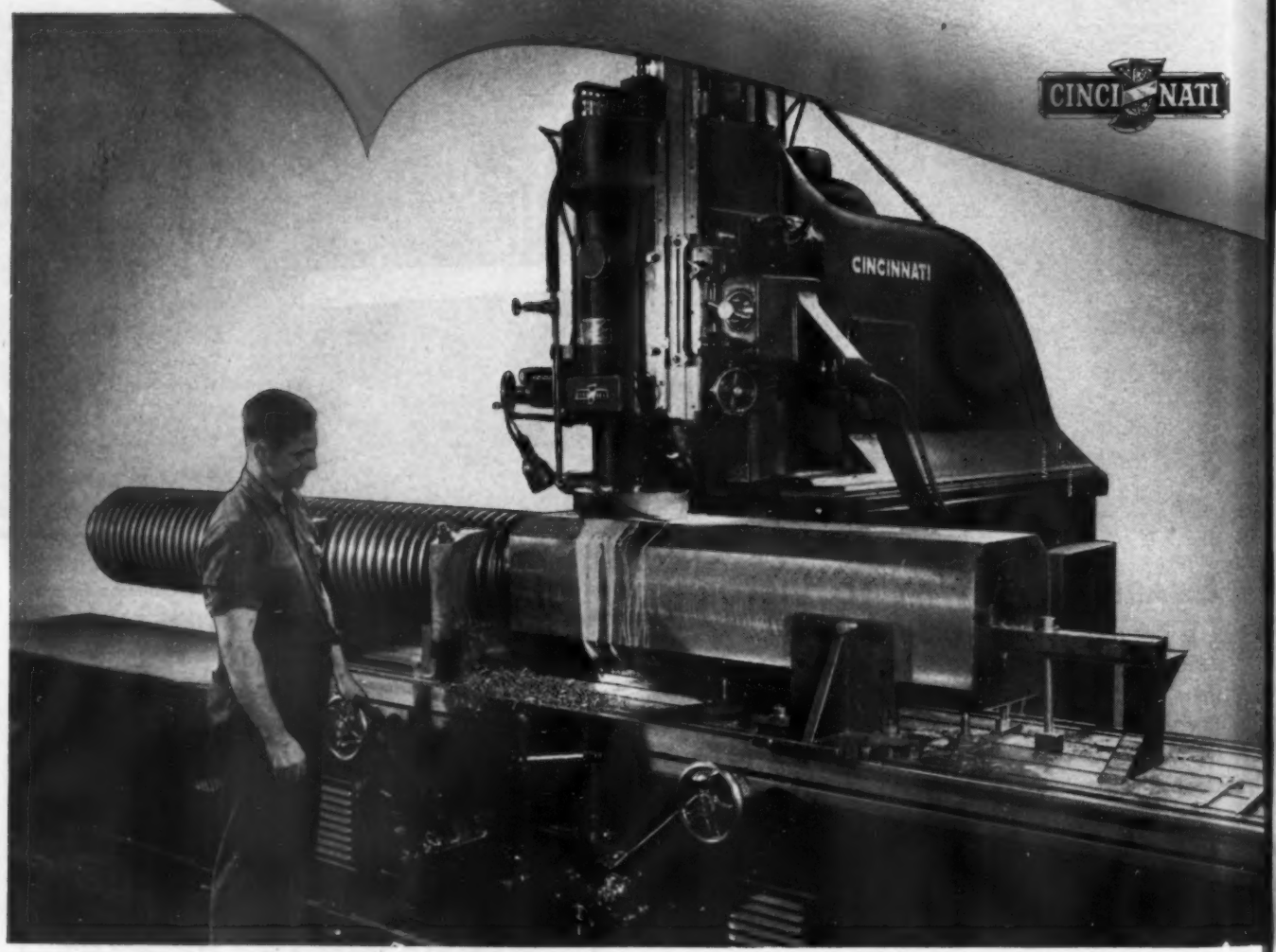
Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

Blooming Mill Hold-Down Screw

MILLED FASTER and MORE ACCURATELY

ON A CINCINNATI HYDRO-TEL

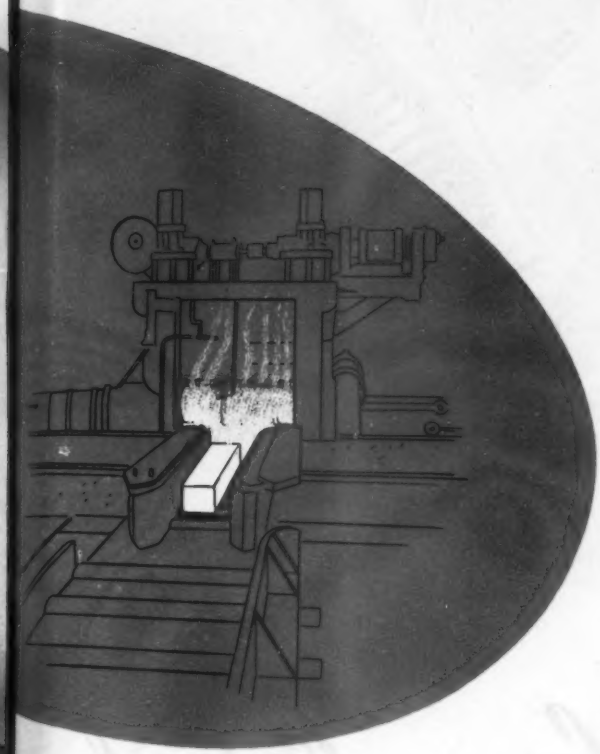


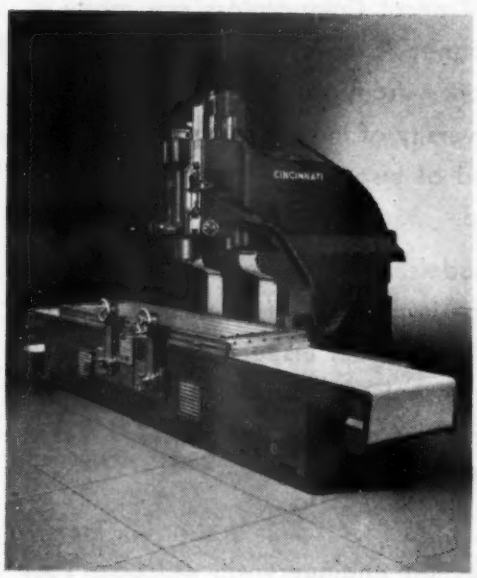
Notice the length and rigid construction of the Hydro-Tel bed. This assures accurate milling of these long, heavy parts. The part being milled is over 100" long and weighs more than 4000 pounds.

Keep on buying WAR BONDS

THE CINCINNATI M

MILLING MACHINES



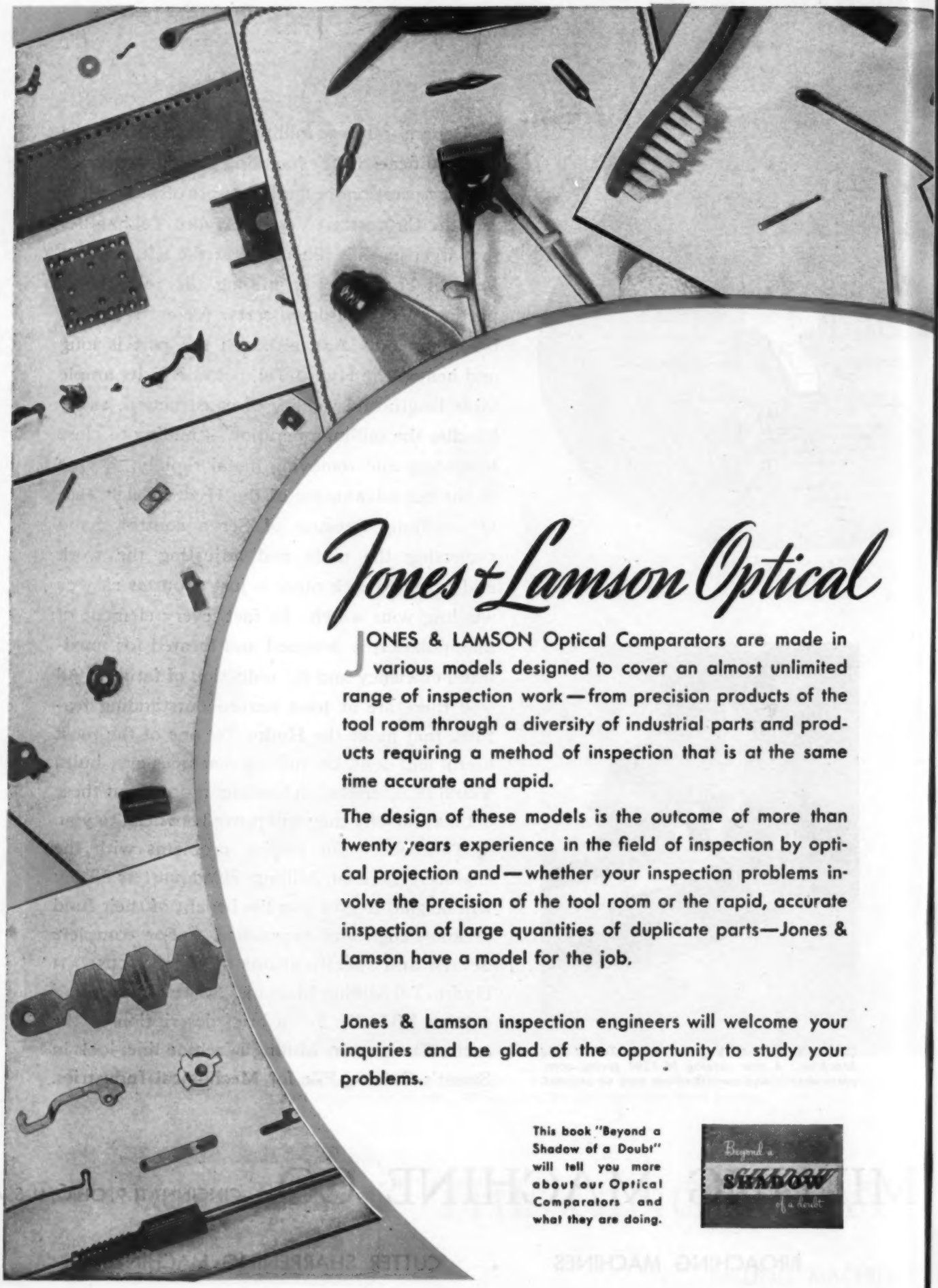


CINCINNATI *28-60 Vertical Hydro-Tel Milling Machine. A new catalog M-1284 giving complete details and specifications sent on request.*

● General-purpose milling machines must have the qualifications for handling a wide variety of milling operations and many types of work. How well the CINCINNATI Vertical Hydro-Tel handles the larger parts is illustrated at the left. Here a Vertical Hydro-Tel is milling the rectangular portion of a hold-down screw for a steel plant blooming mill. And although the part is long and heavy, the Hydro-Tel, because of its ample table length and rigidity of construction, easily handles the milling operation — milling to close tolerances and removing metal rapidly. ¶ One of the big advantages of the Hydro-Tel is ease of handling. Because of Servo control, hand traversing the table and adjusting the work and cutter to each other is just about as easy as winding your watch. In fact, every element of manipulation is designed and located for maximum efficiency and the reduction of fatigue. All told there are at least sixteen outstanding features that make the Hydro-Tel one of the most useful and desirable milling machines ever built. You'll be interested in learning more about these details and why they will prove beneficial to you. ¶ Talk over your milling problems with the engineers here at Milling Headquarters. They will be glad to give you the benefit of their fund of knowledge and experience. ¶ For complete details and specifications of the CINCINNATI Hydro-Tel Milling Machines, write for a copy of catalog M-1284. For a brief description of the entire CINCINNATI Milling Machine line, look in Sweet's Catalog File for Mechanical Industries.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES



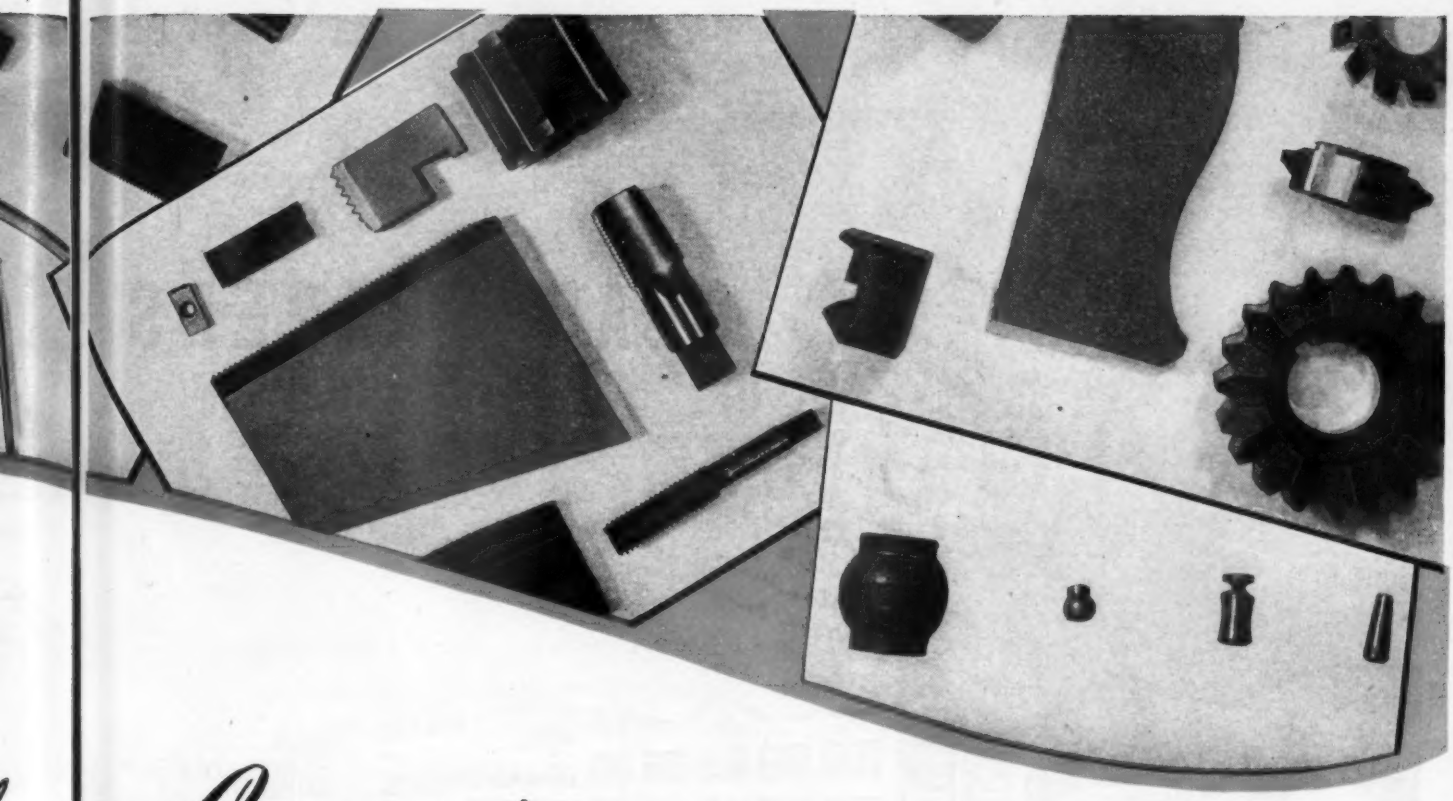
Jones & Lamson Optical

JONES & LAMSON Optical Comparators are made in various models designed to cover an almost unlimited range of inspection work—from precision products of the tool room through a diversity of industrial parts and products requiring a method of inspection that is at the same time accurate and rapid.

The design of these models is the outcome of more than twenty years experience in the field of inspection by optical projection and—whether your inspection problems involve the precision of the tool room or the rapid, accurate inspection of large quantities of duplicate parts—Jones & Lamson have a model for the job.

Jones & Lamson inspection engineers will welcome your inquiries and be glad of the opportunity to study your problems.

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.



Comparators - A MODEL FOR EVERY JOB...

WHEN PURCHASING EQUIPMENT FOR MEASUREMENT AND INSPECTION BY OPTICAL PROJECTION, YOU SHOULD DEMAND:

1. Precision Condensing Lens System for controlling light.

2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.*

3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness.

4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other.

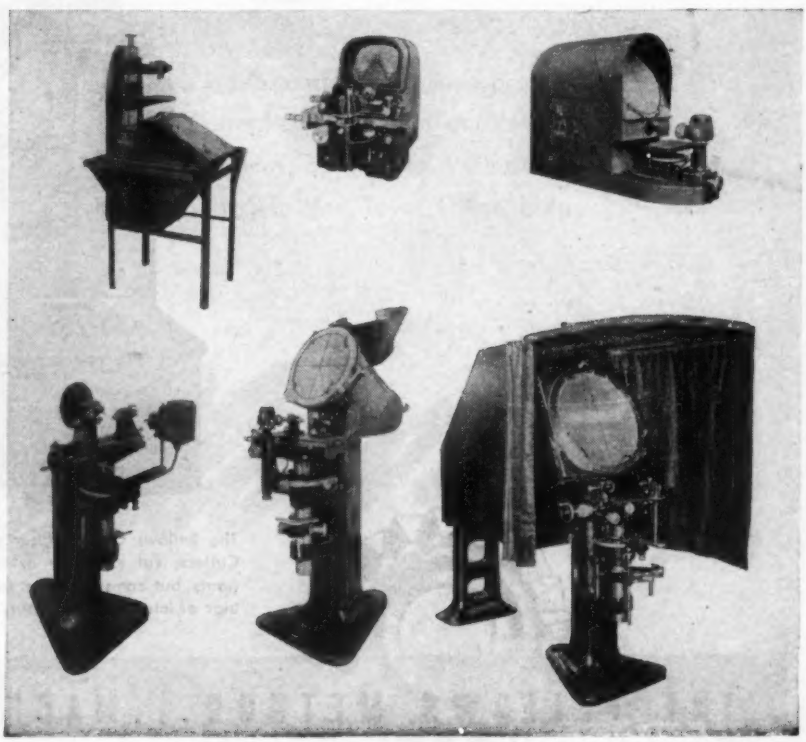
5. Rigid Machine Construction.

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

PROFIT-PRODUCING MACHINE TOOLS



GEAR SHAPERS

The Fellows Gear Shaper and Gear Shaper Cutters, cut not only external and internal gears, but cams, ratchets, sprockets and irregular or interrupted contours of infinite variety.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

plus

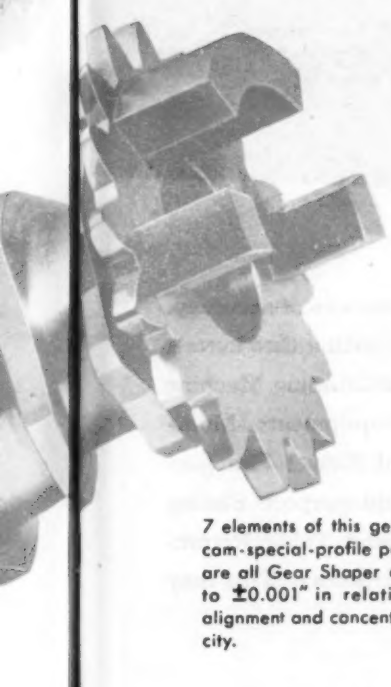
CREATIVE ENGINEERING

There's a time-honored proverb about the world beating a path to one's door. And, strangely enough, it has come true, on many occasions, up here in Springfield, Vermont. Certainly, the guest register at the Hartness House, atop the hill, records the visits of a lot of gear-interested folk from distant cities and many lands.

True, we've made Gear Shapers for all the world to use. But there's more to it than that. Through the years there has been drawn together at Fellows such a group of specialists in gear engineering and manufacture as exists perhaps nowhere else in this land of ours.

The sum of their experience in precision gear manufacture is gathered together into a coordinated sequence of manufacturing and inspection operations, collectively known as "The Fellows Method". Within its flexible functioning seems to lie a common solution to many problems of gear and kindred parts design, as related to economical large scale manufacture.

Any wonder then that a man with a substantial production problem finds it so worth while to come to Springfield, up here in our Vermont hills? The Fellows Gear Shaper Company, Springfield, Vermont . . . also 616 Fisher Bldg., Detroit 2 and 640 West Town Office Bldg., Chicago 12, Illinois.



7 elements of this gear-cam-special-profile part are all Gear Shaper cut to ±0.001" in relative alignment and concentricity.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

CINCINNATI *Hydraulic Universal Grinding Machines are available in 12", 14", 16" and 18" swings; and 36", 48" and 72" between-center lengths. (12" size illustrated below)*

MODIFIED TOOLROOM

Does special production

CINCINNATI Application Engineers have demonstrated many times that standard CINCINNATI machines, with some modification, will handle a big percentage of so-called special jobs. The case illustrated is a good example: Grinding the face and hub diameter of aircraft engine master rods. This type of job presents several requirements: a) large swing; b) grinding wheel set at an angle; c) special truing; d) close tolerances of accuracy. These requirements were met with a CINCINNATI 18" x 36" Hydraulic Universal Grinding Machine and the following special equipment: Modified Headstock; Wheel Head Swivel Plate arranged to bridge table; Multi-purpose Sliding Table; Face Plate Fixture; and Table Retraction Controls (for loading purposes). This may

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES

GRINDER *job!*

CINCINNATI *18" x 36" Hydraulic Universal Grinding Machine after it has been modified to handle a highly specialized job of grinding face and hub diameter of master rods.*

seem like a lot of special equipment, but actually the grinding of these master rods, a highly specialized job, is handled on a machine more than half of which is standard. ¶ It's possible you may have a grinding job that could be handled to better advantage on a slightly modified machine. Why not talk it over with the engineers here at Grinding Headquarters? They will be glad to give you the benefit of their wide experience in either centertype or centerless grinding operations. ¶ For complete details and specifications on CINCINNATI 12" Hydraulic Universal Grinding Machines, ask for catalog G-486-1. For the 14", 16" and 18" machines, ask for catalog G-474-1. Sweet's Catalog File for Mechanical Industries gives a brief description.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VERSATILE CUTTERHEAD..
SAVES WORK RESET-UPS
SIMPLIFIED CONTROL..
PROVIDES EXTRA OPERATING CONVENIENCE

SPECIFICATIONS

No. 22L UNIVERSAL MILLER. Table: 45" x 10". 9 Speeds: 40 to 1100 r.p.m. 12 Feeds: 5" to 36". Cutterhead adjustable between vertical and horizontal: 90°

..on VAN NORMAN Universal Millers

The versatile cutterhead on Van Norman Ram Type Universal Millers gives you vertical, horizontal or angular milling by simply swinging the cutterhead to the desired milling position. Thus in one compact machine you have the range of several types of millers.

This Van Norman feature enables operators to complete most milling operations on a workpiece without resetting the work. In addition, there is no waiting for other types of millers to become available. The valuable time saved often increases the productive output of the machine and operator by as much as 50%. (note the typical milling applications shown below)

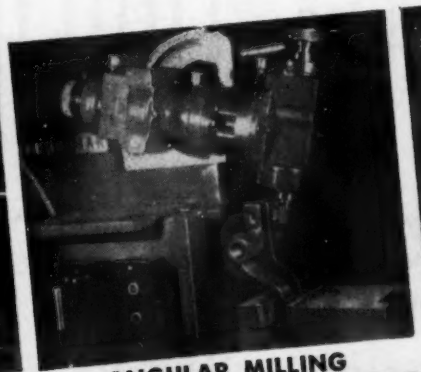
The adjustable cutterhead...combined with front and rear directional control of all power feeds for the table, knee, saddle, as well as 6-way rapid traverse... quick-change speed and feed selectors conveniently located for easy reach by the operator... and other important Van Norman Features which assure accuracy, economy and top production.

"It pays to Van Normanize"

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

HORIZONTAL MILLING



ANGULAR MILLING

VERTICAL MILLING

BORING

SLOTTING

ANGULAR MILLING with sub head

U. S. Army Air Forces Photo

For Finer Thread Accuracy . . .

LANDIS PRECISION THREAD GRINDER

The LANDIS Precision Thread Grinder is a precisely built machine tool, developed especially for grinding threads of extreme accuracy. Many manufacturers depend on their LANDIS Thread Grinder for the finer thread accuracy of aircraft and automotive components that must be produced to extremely close tolerances.

The illustration at the right shows a LANDIS Precision Thread Grinder in the Mid-Western plant of a leading aircraft engine manufacturer, grinding valve stems for aircraft engines. These valves are used not only on new plant assembled engines, but as replacement parts in A.A.F. bases throughout the world.

Write for Bulletin E-93

LANDIS MACHINE CO.

U. S. Army Air Forces Photo

WAYNESBORO PENNA. U.S.A.

SPOT WELDING? SEAM WELDING?

Here's a NEW Method of Keeping Weld Current Constant . . . AUTOMATICALLY

In this application, the G-E current-regulating compensator enables the operator to use the press and gun welder interchangeably, when welding materials of the same thickness, without making any additional adjustments—even though the resistance of the portable secondary cable for the gun welder is appreciably greater than the resistance of the secondary circuit of the press welder.

G-E CURRENT-REGULATING COMPENSATOR

THIS new current-regulating compensator will *automatically* correct for line-voltage variations and power factor, or impedance, changes, and will do it within three cycles. It will hold the current within plus or minus 2 per cent of normal, where changes would cause the unregulated current to vary as much as plus or minus 20 per cent.

You Get These 5 Other Advantages, Too

1. *Flexibility of Operation*—The same control settings can be used, and consistent results can be obtained when: (a) using a press-type spot welder; (b) using a gun welder connected to the same welding transformer; or (c) welding magnetic materials with a press- or gun-type welder with the material in or out of the throat of the welding machine.

2. *Improved Quality*—Without the use of this control, the introduction of material in the throat of the welder would cause unsatisfactory welds because of the changes in welding current. It would do so in many applications, such as in the welding of barrels, propeller blades, or large steel assemblies.

3. *Seldom Needs Adjustment*—After the operator has once determined the proper settings for an operation, no further adjustments are necessary—the current-regulating compensator takes care of variations.

4. *Electronic*—Electronic tubes and circuits insure fast operation, good results, long service, low maintenance.

5. *Correlated Design*—This current-regulating compensator is designed for use only with G-E resistance-welding controls which include heat control by the phase-shift method. Complete interconnection diagrams are supplied to assist in installing this equipment.

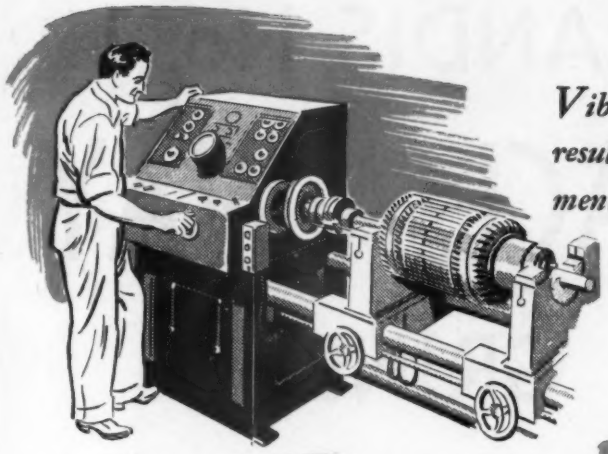
Want More Information?

Bulletin GEA-4220, well-illustrated, describes all the features that make this new current-regulating compensator the solution of many resistance-welding problems. Ask our local office for a copy today. *General Electric Company, Schenectady 5, N. Y.*

Buy all the BONDS you can — and keep all you buy

GENERAL ELECTRIC

RESISTANCE-WELDING CONTROL



Vibration of rotating parts in high-speed apparatus results in undesirable noise and damage to equipment. Here's a cure pump manufacturers are using.

Curing the "Jitters"

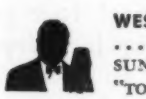
ON HIGH-SPEED ROTATING PARTS

Pump runners, weighing from 30 to 1500 pounds, must be accurately tested to make sure they are in exact static and dynamic balance.

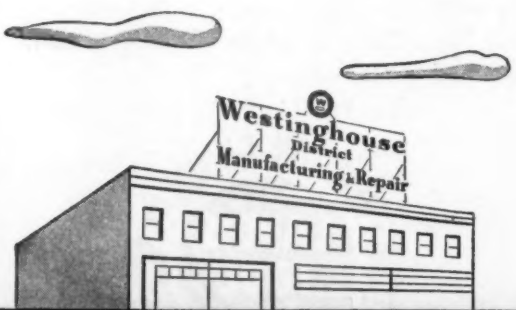
Westinghouse *Manufacturing and Repair** Plants, conveniently located in every district, have the special facilities needed for this job. By means of Dynetric Balancing equipment, the exact location and amount of unbalance is accurately determined. Then weight is applied or removed at proper points on the rotating piece to exactly neutralize the vibration effect.

This is typical of the specialized facilities offered by Westinghouse M & R Plants—a nationwide organization with local branches as close as your telephone. Factory-trained men, using factory methods and equipment, are ready to serve you promptly on any problem involving analysis or repair of electrical equipment.

J-90521



WESTINGHOUSE PRESENTS
. . . JOHN CHARLES THOMAS
SUN. 2:30 EWT., NBC.
"TOP OF THE EVENING"
MON. WED. FRI. 10:15 EWT., BLUE NET.



When vital electrical equipment needs repair . . . phone the nearest office of Westinghouse Electric and Manufacturing Company for

Westinghouse

COMPLETE REPAIR SERVICE

*33 M & R PLANTS • • ONE NEAR YOU

LANDIS No. 1
RACE-A-WAY
GRINDER

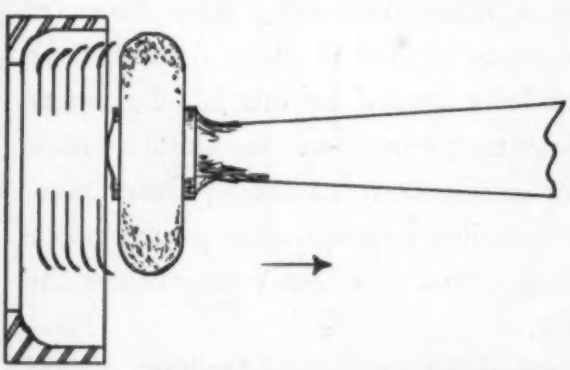
RACES FOR VICTORY

The tremendous demand for Ball Bearings created by the mechanized weapons of World War II has been very successfully met by LANDIS No. 1 and No. 2 Race-A-Way Grinders.

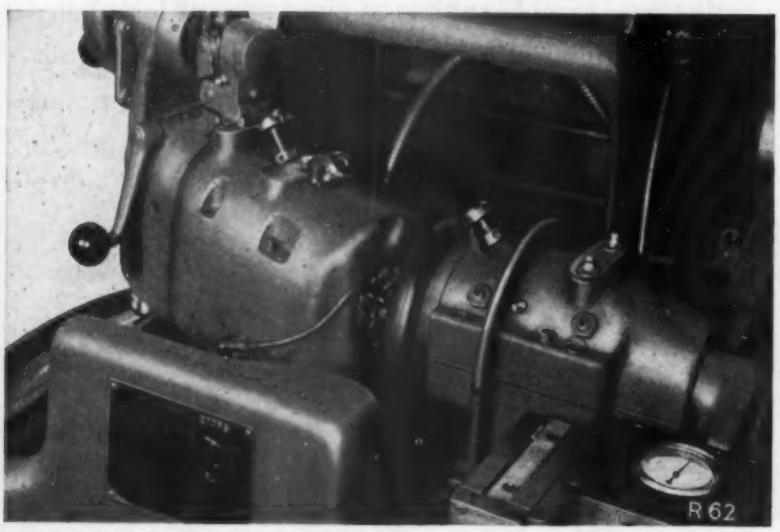
Production grinding of small ball bearing outer races has, in the past, been a very real problem. The LANDIS No. 1 is designed to grind, rapidly and accurately, races up to and including No. 204 size. This machine handles double as well as single row races. Very small size races must be submitted to our Engineering Department for its recommendation.

Continuously high output of controlled quality small races has been made possible by the combination of Automatic Grinding Cycle and 30000 or 50000 rpm Wheel Spindles. The past four years' production records of the Bearing Industry are evidence of this machine's ability to deliver. Together with the LANDIS No. 2 it has been at work in all major bearing plants turning out a solid stream of races for the varied and complex applications occasioned by military requirements.

Your request for a bulletin, or an engineer's visit, will receive prompt attention.



ABOVE: GRINDING THE LAND TANGENT TO THE GROOVE—IN ONE OPERATION.



SET UP VIEW OF A NO. 1 RACE-A-WAY GRINDING A SPECIAL THRUST RACE.

PRECISION GRINDERS
LANDIS TOOL
SINCE 1889
UNIVERSAL RECOGNITION

LANDIS No. 2
RACE-A-WAY
GRINDER

RACES FOR VICTORY

The LANDIS No. 2 Race-A-Way Grinder may be tooled for internal or external races. The internal grinding machine has capacity to handle single row races up to and including the 212, 311 and 409 groups. Single row races up to and including the 218, 316 and 414 groups may be handled by the external machine.

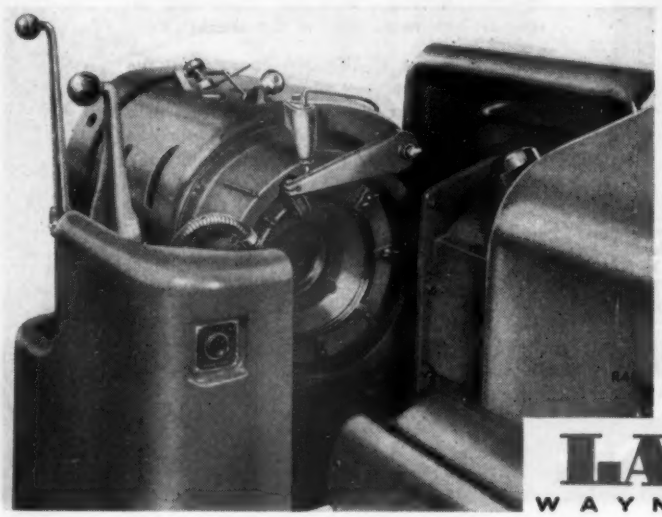
Tooling can be furnished for double row races having a groove spacing of not more than 1⅜"; maximum O.D. for double row races is 5".

On both the No. 1 and No. 2 Race-A-Way Grinders set-up, inspection and adjustment are simplified, with resulting production increases. Naturally, from the user's point of view, high productivity is desirable if the several bearing quality grades can be obtained. This machine, and the smaller No. 1, through Automatic Grinding Cycles and correctly determined Wheel Spindle Speeds increase what has been previously accepted as normal output. This is particularly interesting because operator acceptance is established.

Manufacturers making more than one type of anti-friction bearings will find LANDIS experience helpful. May we put it to work for you? 444

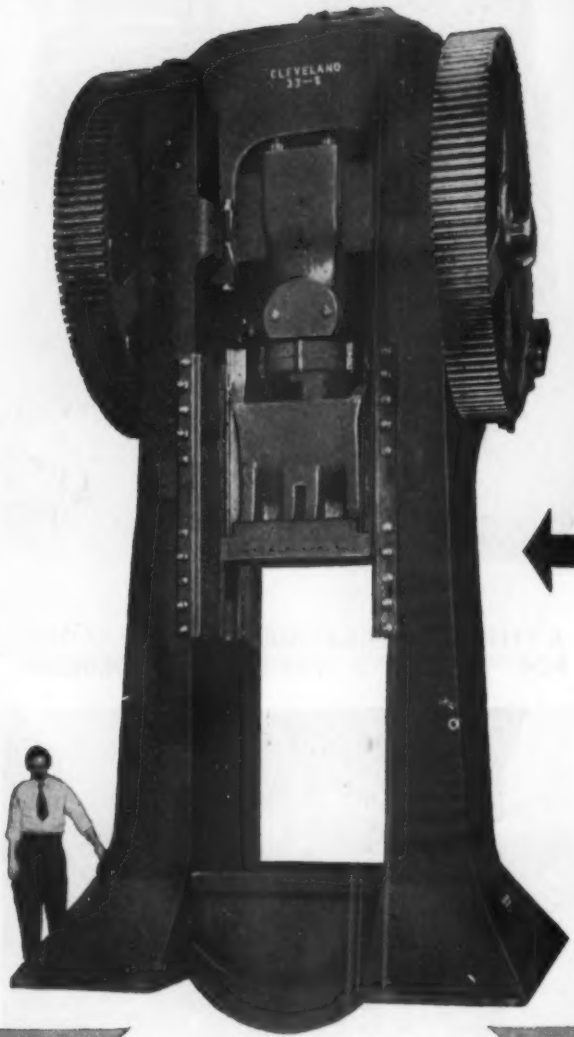
A TYPICAL INTERNAL GRINDING OPERATION FOR A NO. 2 RACE-A-WAY GRINDER.

LEFT: AN INTERNAL OPERATION ON A LARGER THAN AVERAGE RACE.



LANDIS TOOL CO.
WAYNESBORO, PENNSYLVANIA.

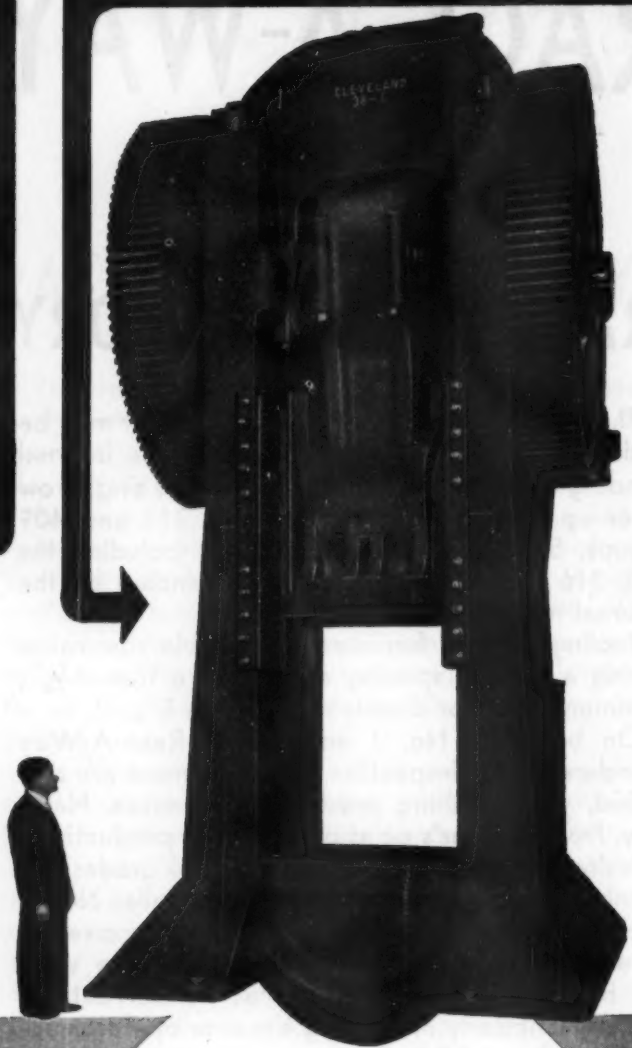
1500 TONS CAPACITY



Cleveland Straight Sided Single Crank Presses can be furnished in capacities ranging from 75 tons to 1500 (which is the rated capacity of the 33S illustrated) and in sizes to suit particular requirements.

This Press, which is double geared and arranged for twin drive, is equipped with an air friction clutch and brake, electrically controlled, and is also provided with a separate air clutch for the flywheel.

2400 TONS CAPACITY



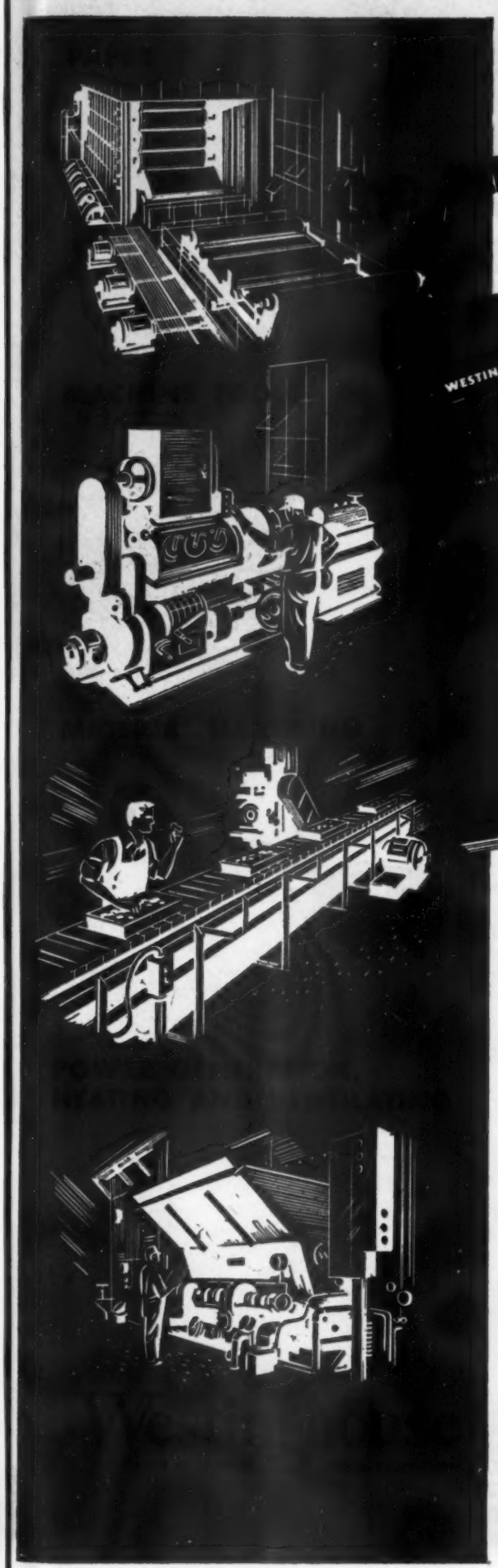
This powerful Single Eccentric Press, which exerts a pressure of 2400 tons, is equipped with a two station electrically controlled air operated friction clutch and brake and arranged with twin drive to the crankshaft.

It has a stroke of 18" and operates at the rate of 20 strokes per minute. Other Presses of this particular type can be furnished in a wide range of standard sizes and with bed area, stroke, adjustment, etc., to suit particular requirements.

THE CLEVELAND PUNCH & SHEAR WK'S CO. U. S. A.

The CLEVELAND PUNCH & SHEAR WORKS Co.

CLEVELAND, OHIO



...nswer is in this book

ELECTRONIC

MOTOR CONTROL

How to get Stepless d-c Motor Speeds from an a-c Current Supply

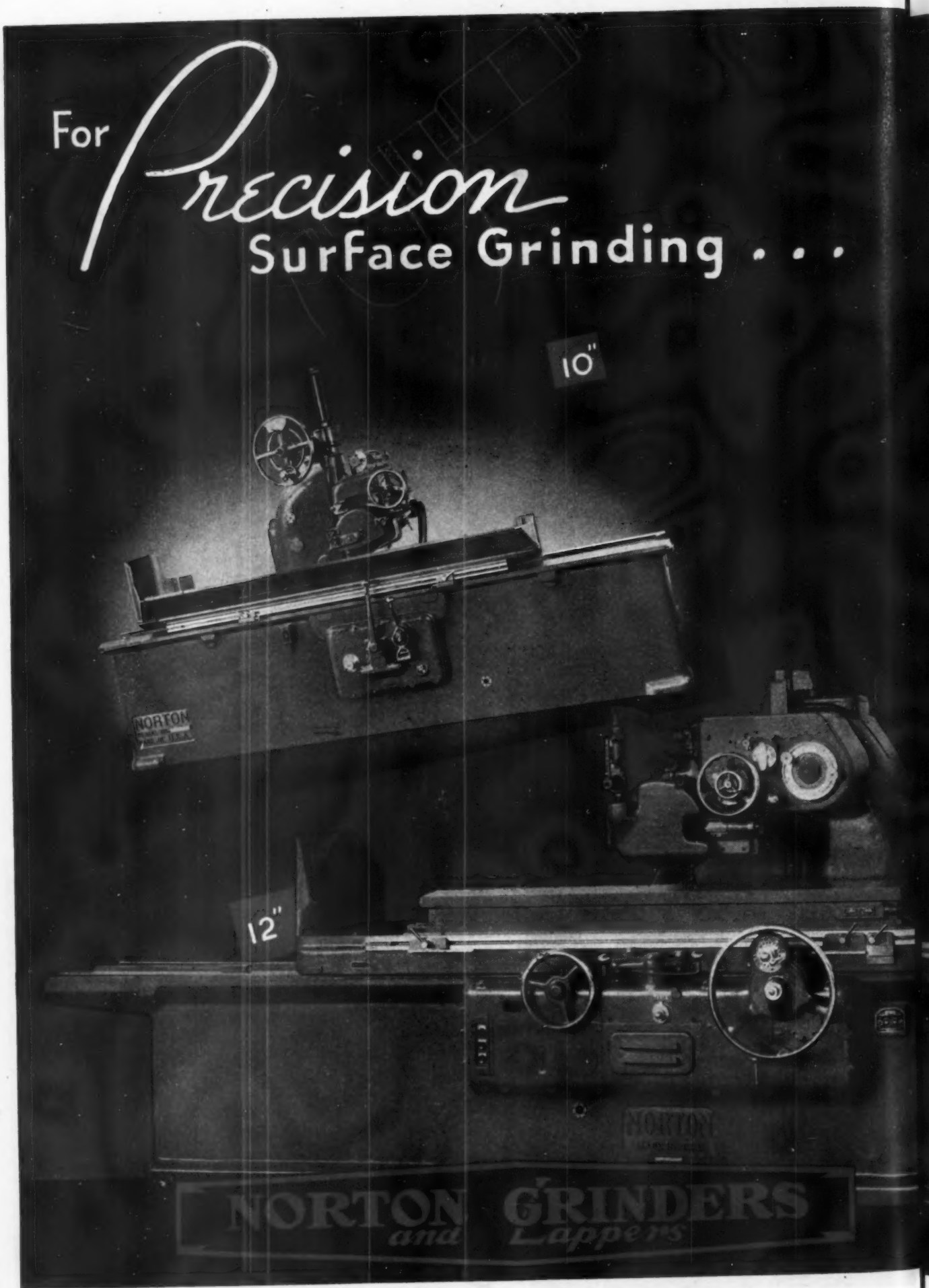
Mot-o-Trol, developed by Westinghouse, employs the precision of electronics to provide a new, wide, *stepless* range of speed control for d-c motors from an a-c current source. It starts motors, brings them up to preset speed smoothly and rapidly. It permits wide change of speed at any time, regulates speed under varying loads, applies dynamic braking for timed stopping—and reverses the motor. Many other functions are also possible. There are no separate linestarters—no field rheostats. To get all the facts about this new packaged motor drive, write today for your copy of booklet B-3301. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-21306

MOT-O-TROL

WESTINGHOUSE

Electronics at Work


For Precision Surface Grinding . . .
10"
12"
NORTON
NORTON GRINDERS
and Lappers

NORTON GRINDERS COVER WIDE RANGE

...for Production or Tool Room Surfacing

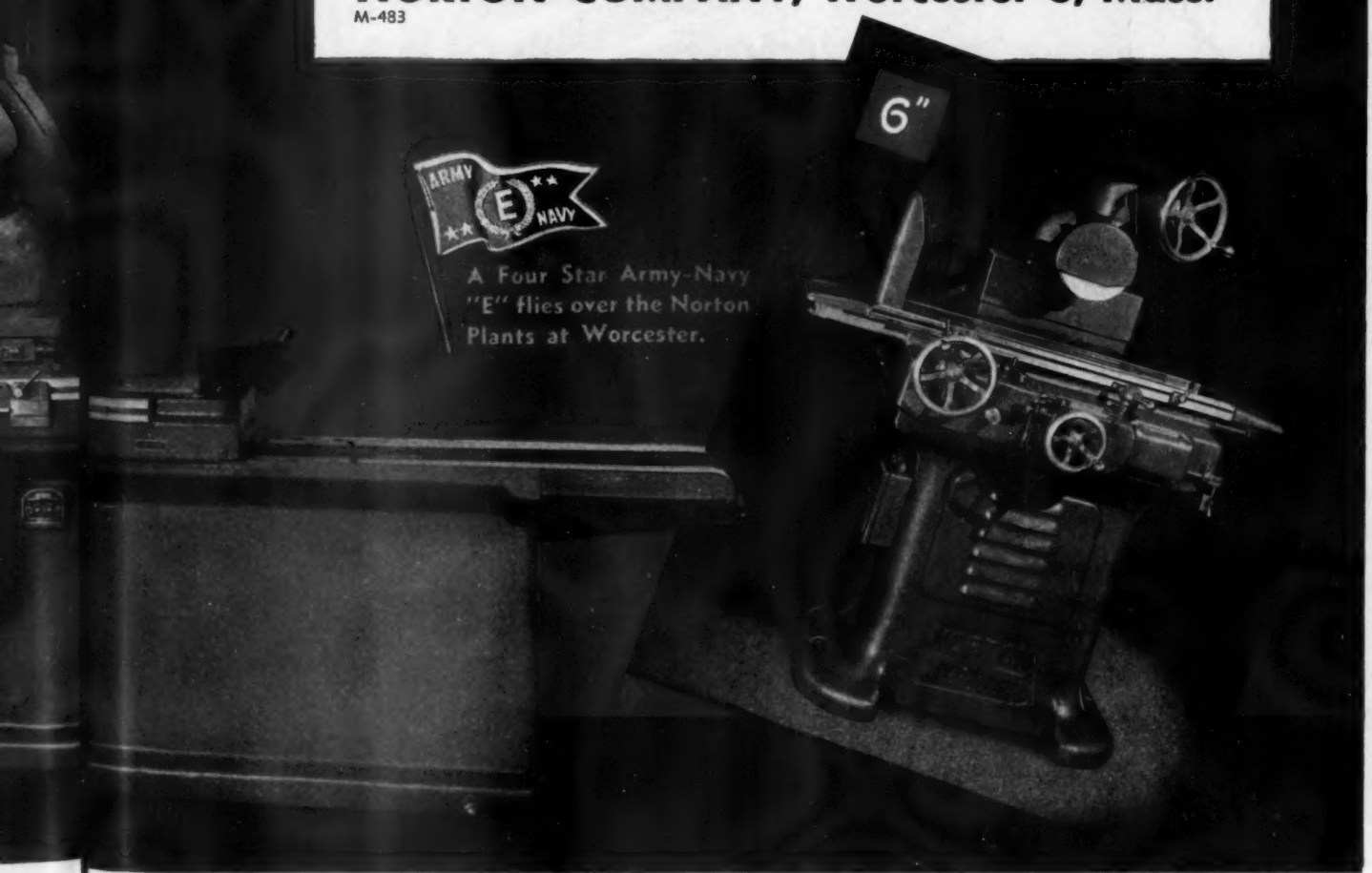
WHERE surface finish and dimensional accuracy must be better than average and production must be maintained at high levels, the Norton Surface Grinder fulfills the requirements of accuracy, and provides fast, convenient operation.

All the machines in the Norton line of Surface Grinders — in 6", 10" and 12" capacities — are precision-built for precision work. There is no sacrifice of stamina, however, and these surface grinders have an enviable record of long-lived, high-production accuracy.

Hydraulic operation is featured, with controls concentrated for operator convenience. Hand feeds supplement smooth power movement. Time-tested design gives easy adjustment and reduces maintenance to a cost-saving minimum throughout the full line of Norton *precision-built* Surface Grinders.

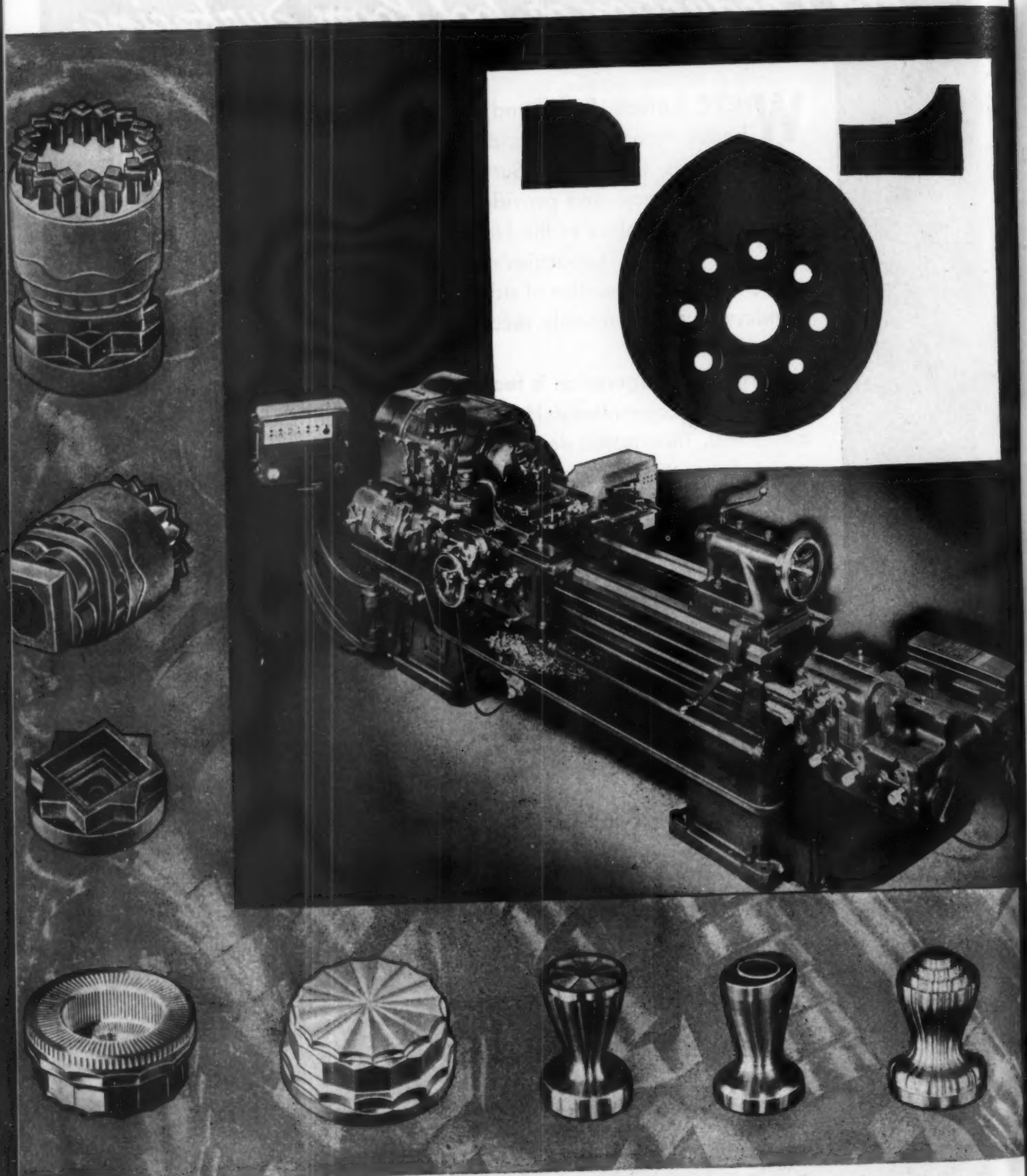
NORTON COMPANY, Worcester 6, Mass.

M-483



A Four Star Army-Navy "E" flies over the Norton Plants at Worcester.

Thousands OF SHAPES TURNED



THE MONARCH MACHINE

FROM *One* MASTER CAM....

ON THE MONARCH SHAPEMASTER

Amazing as it may seem, most of the shapes illustrated can be produced from the one master cam, on the MONARCH SHAPEMASTER. This cam produces the shape of a die, mold or irregular shape, while Monarch-Keller electrical controls reproduce the irregular contour of the work, from a thin metal template.

This machine will produce mechanically perfect shapes in any quantity, at least four or five times faster than by other methods. It was developed shortly before the War, but was withdrawn to permit vastly increased production of standard Monarch Lathes for the War program. Now, however, MONARCH SHAPEMASTERS are available for all classes of War industry with reasonably short deliveries.

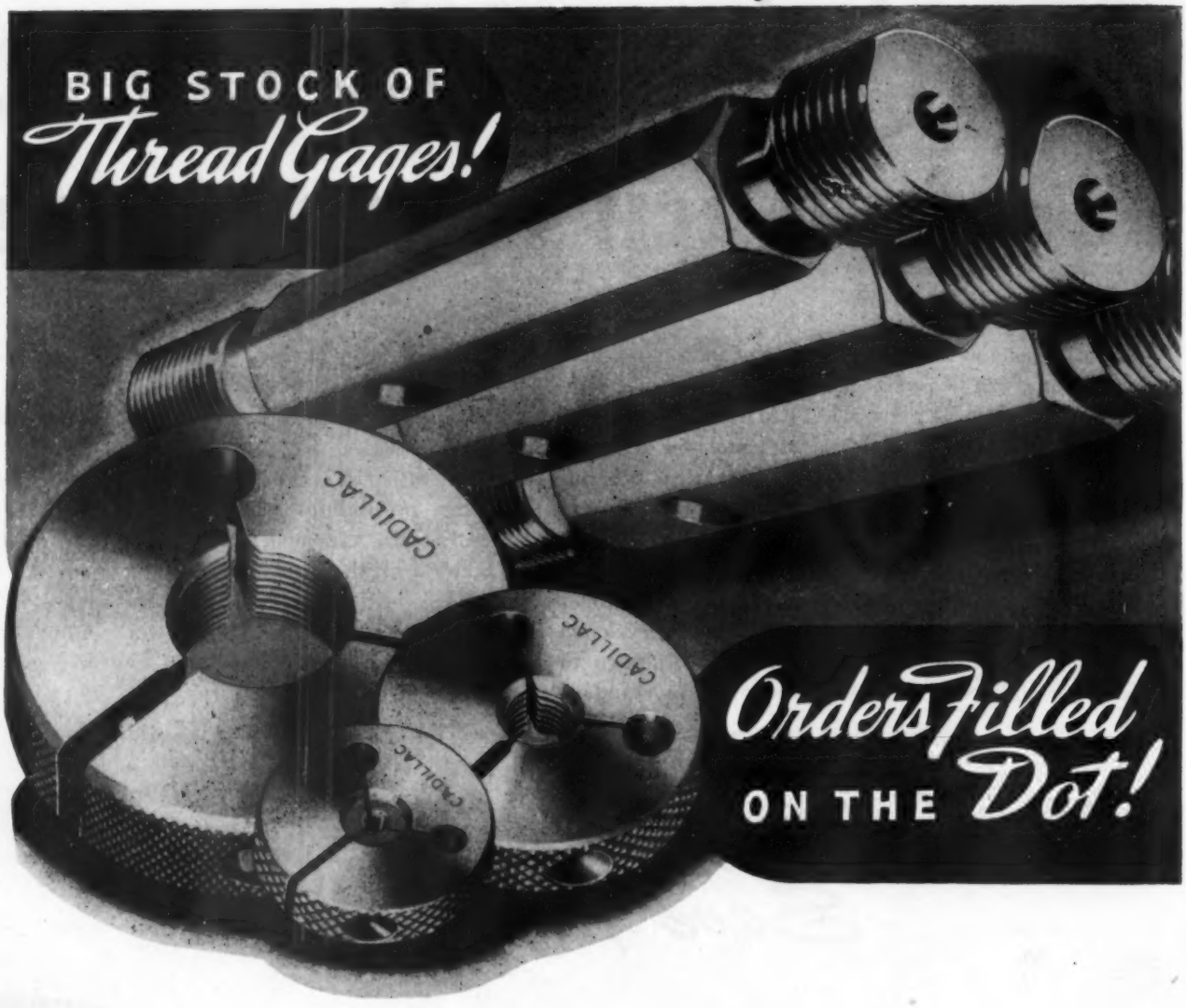
For those interested in the time and money saving possibilities of MONARCH SHAPEMASTERS, a demonstration will be arranged. Or, we'll gladly machine test samples or study drawings of tough jobs, to prove the adaptability of the machine for your specific work. Address us at Sidney, Ohio, or at one of our convenient branch offices.

Direct factory branches at Chicago • Cleveland • Detroit • Newark • Pittsburgh • Representatives in principal cities.

MONARCH LATHES *Save Time*

Notice the intricate pattern being turned on the MONARCH SHAPEMASTER. Almost any shape and contour on the outside, inside or face of any work piece can be reproduced accurately and rapidly on this machine.

TOOL COMPANY · SIDNEY, O.



CADILLAC Thread GAGES

WIRE YOUR ORDER Today!

ALL STANDARD SIZES

NATIONAL FINE
NATIONAL COARSE
0-80 to 1½-6
ALSO
PIPE PLUG GAGES
⅛ to 1¼

IF there is a stoppage in your production line due to a lack of Thread Plug or Thread Ring Gages of any standard size, here's good news! You can break the bottleneck overnight by wiring us for whatever sizes you need.

With a stock of thousands of gages, all ready to pack and ship, we are in a position to fill orders right on the dot. Except in case of an abnormal demand for some particular size, all orders received by 4:00 p.m. are shipped the same day.

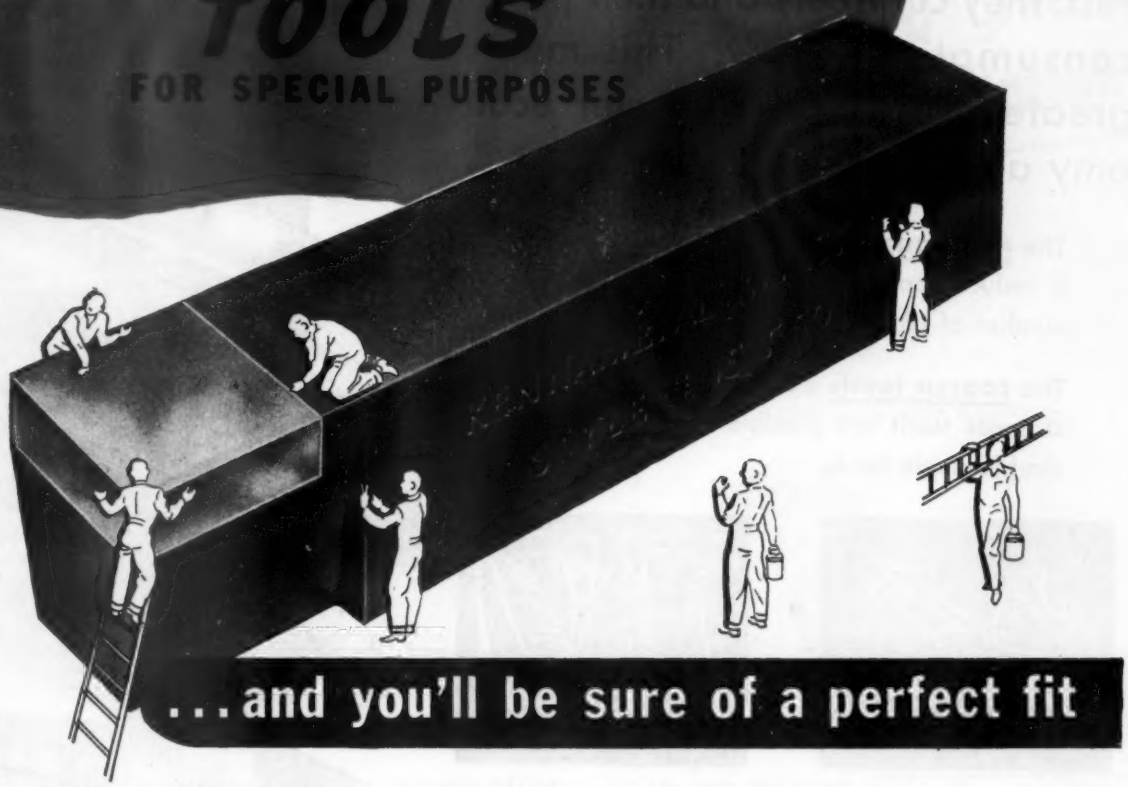
Speedy shipment, plus adherence to the highest standards of accuracy in manufacture, have combined to make Cadillac the source of supply upon which the nation's leading armament makers depend for a large portion of their thread gage requirements.

CADILLAC THREAD GAGES
CADILLAC

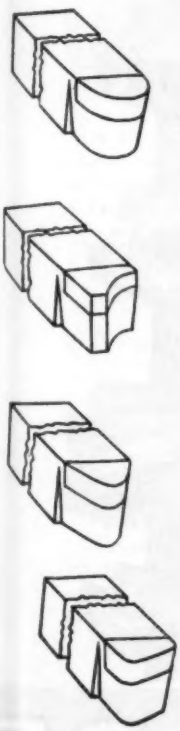
CADILLAC GAGE COMPANY, *Detroit 5*

LET US CUSTOM-TAILOR Your KENNAMETAL-TIPPED TOOLS

FOR SPECIAL PURPOSES



...and you'll be sure of a perfect fit



Fitting a carbide tool to the work is a job for specialists—and the skill with which the tool is ground is directly reflected in increased production. Kennametal standard tools will handle the majority of usual metal-cutting jobs, but even if their number were multiplied by ten, there still wouldn't be a sufficient variety. For the tool must be fitted to the work, not the work to the tool.

Our personnel is trained in the art of properly grinding Kennametal-tipped tools. A modified standard tool design produced by us gives the same high performance as a standard tool. There are no thinned-out carbide tip dimensions caused by cutting to required angles. There are no minute accordion cracks resulting from excessive heat generated by "bearing down" to hasten the grinding process.

When we supply the complete tool a simple modification often will cost less than the abrasive wheel alone that would be used up in modifying a standard tool. Even the more complicated modifications can be produced by us more cheaply, for a revision that requires hours of grinding in your shop, takes only minutes in ours. When you need modified standards call on our nearest Field Engineer. Or . . . send us drawing, sketch or blue print with angles and sizes shown. Specify grade of Kennametal or describe work. For complete instructions see our new Tool Manual. Write for a copy of it today.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

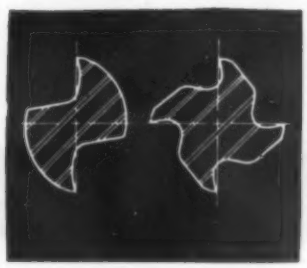
KENNAMETAL Inc., 103 LLOYD AVE., LATROBE, PA.

We're "On Top" of END M ERIES

The performance of Brown & Sharpe End Mills is outstanding — they cut fast, they cut freely and their power consumption is low. This means greater production, greater economy and long end mill life.

The **rake angle** is the result of exhaustive tests. It reduces power consumption and increases the number of pieces per sharpening.

The **coarse teeth** increase cutting efficiency and stronger teeth are possible through the use of a double angle land.



Hollow faces and rake are produced by a generating process. Angle of rake tends to remain constant as mill is resharpened.

At left—small helix angle for milling slots where accuracy is essential. *At right* — steep helix angle provides smooth, fast cutting action for most requirements.

. . . We urge buying through the Distributor

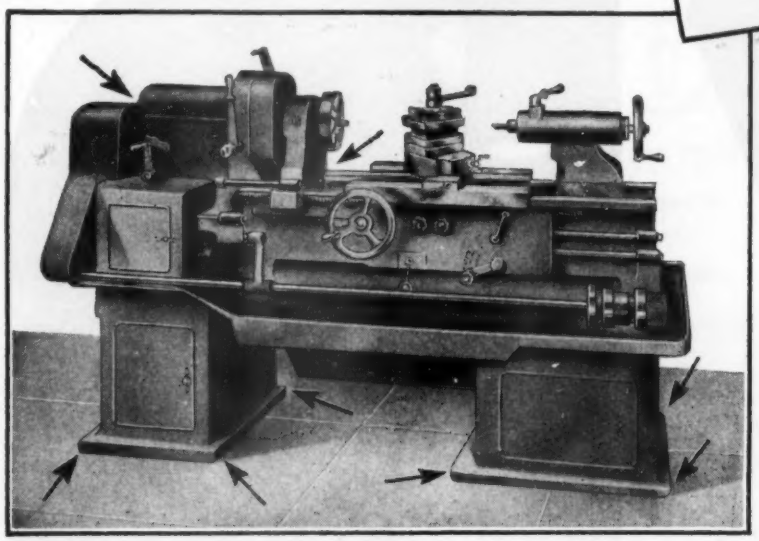
B&S BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.

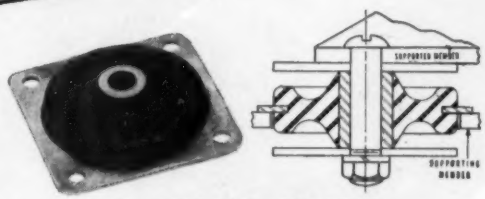
BROWN & SHARPE CUTTERS

Only

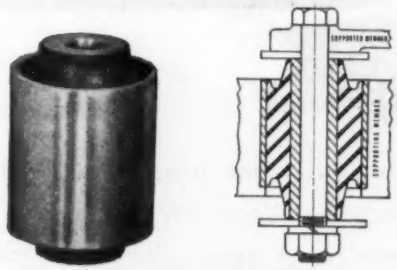
LORD
BONDED RUBBER
Shear Type MOUNTINGS

Fill All Requirements for Highest Degree of Vibration Isolation





LORD PLATE FORM MOUNTING



LORD TUBE FORM MOUNTING

The typical machine tool illustrated above shows various points where Lord Mountings can be located to effectively isolate the harmful effects of shock and vibration.

1. Entire machine can be flexibly suspended, isolating it from surrounding shock and vibration.
2. Various active components such as motors, can be individually mounted to isolate surrounding areas from any disturbing forces emanating from this source.
3. Gauges or instruments can be individually mounted, insuring accuracy and readability.

The use of Lord Mountings will prolong equipment life, insure accuracy of operations, speed production, lower maintenance costs, reduce equipment weights by eliminating necessity of inertia masses, and minimize noise by breaking up metallic paths for sound travel.

Lord Shear Type Mountings are the result of 20 years' specialization in the design and manufacture of Bonded Rubber-to-Metal products to control and/or isolate vibration. Lord Mountings are made in two Basic designs, Tube Form and Plate Form with variations to suit special conditions. Load Ratings of standard sizes range in small increments from a few ounces to several thousand pounds.

There is a Lord Mounting to suit any combination of weight, frequency, deflection or operating condition.

For complete information covering all Lord Mountings, as well as an engineering discussion on vibration control, write for Bulletins 103 and 104, or call in a Lord Vibration Engineer for consultation on your design problems. There is no obligation.

CHECK-LIST OF CHARACTERISTICS

- ✓ 1. Lord Mountings are sturdy, compact, lightweight and easy to install.
- ✓ 2. Bonded rubber-to-metal design allows free shear freedom to rubber element.
- ✓ 3. Suspension is soft in direction of disturbing forces . . . stable in all other directions.
- ✓ 4. The Lord Method produces a bond as strong or stronger than the rubber . . . can bond to various steels, brass and monel metal, using either natural or synthetic rubber.

★ ★ ★
Let's All Back The Attack
Buy EXTRA War Bonds
★ ★ ★

IT TAKES RUBBER *In Shear* TO ABSORB VIBRATION

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ERIE, PENNSYLVANIA

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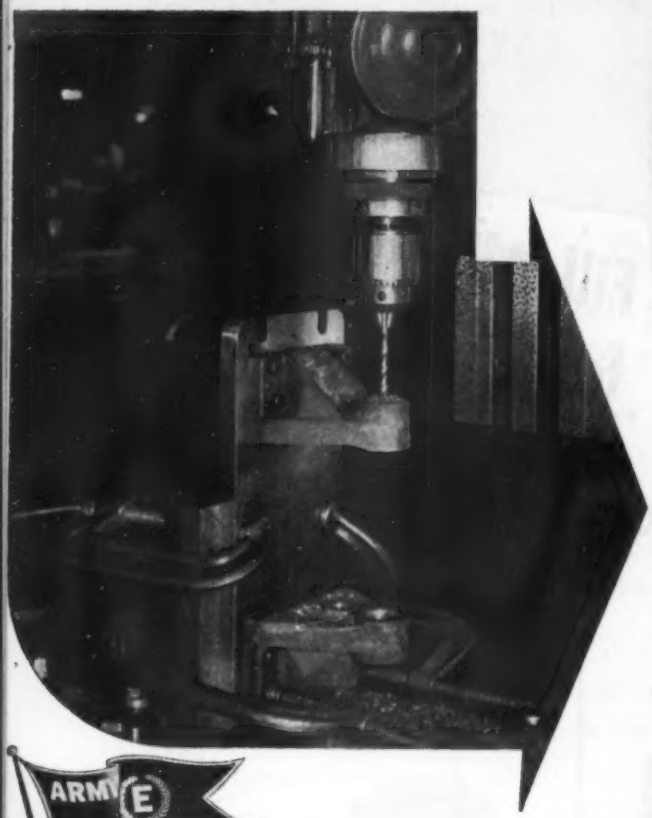
TORONTO, CANADA

Originators of Shear Type Bonded Rubber Mountings

For ACCURACY...VERSATILITY...ECONOMY...

FOSDICK
JIG BORER



Accuracy — the product of rigid, rugged construction — Versatility from design that permits wide range application — Economy — that begins with the initial cost and is further reflected in the low cost per piece — these are three important reasons for the growing success of the Fosdick Jig Borer.

A typical Jig Borer job is shown. Here a Fosdick Jig Borer is drilling precision holes in a fixture at Superior Tool and Die Corporation.

For your precision work in the tool room or tool and die shop consult Fosdick. Full details of construction — features of design — and examples of operating economy are found in the Fosdick Jig Borer Bulletin J. B. A. *Want one? Write.*

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

CROSS SHELL LATHES

First Choice of Leading Shell Shops

Ample Horse-Power
to take FULL ADVANTAGE
of Carbide Tipped Tools

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FINISH TURNING
5″
155 mm.
8″
240 mm.
10″
12″

100 H.P.
ROUGH TURNING
105 mm.
5″
155 mm.

150 H.P.
ROUGH TURNING
8″
240 mm.
10″
12″

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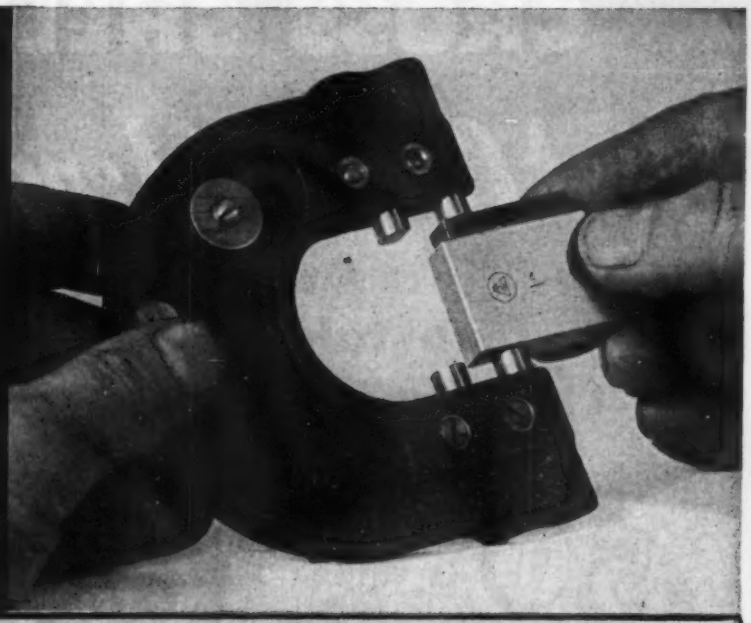
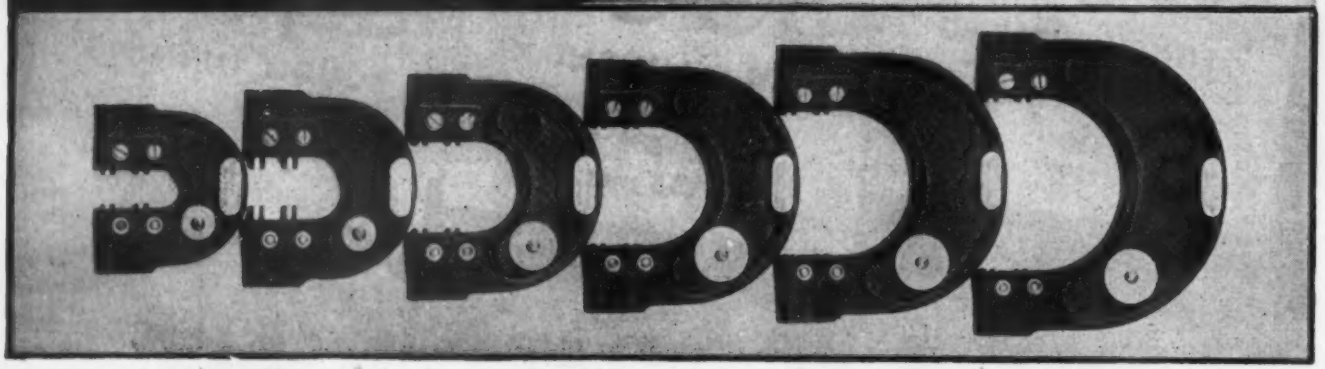
YOUR PRODUCTION INSPECTION CAN BE SPEEDED WITH ATLANTIC ADJUSTABLE LIMIT SNAP GAGE SETS





. . . SIZE RANGE FROM 0 to 6"

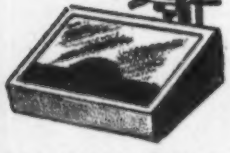
These sets provide the means for instant inspection with a minimum dependence on operator's skill. Even the novice (man or woman) can quickly become proficient in inspecting machined, turned or ground work. With these sets, all parts from the smallest size up to 6" diameter can be checked by the fast and accurate "go" and "no go" method. With several sets available, it is possible to select the one that comes within the range of your specific work.

An important feature of the "ATLANTIC" is the use of Meehanite frames to assure utmost rigidity and maintain the original form and shape of the frames. Long-lived accuracy, even in hard continuous service, can be depended on as a result of using this special metal in construction.

ATLANTIC ADJUSTABLE SNAP GAGES can be furnished with a wide range of special anvils for special work. Outline your requirements for quotation.

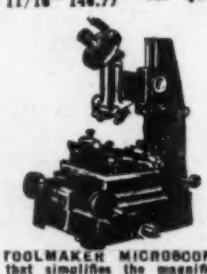
SETS AVAILABLE FOR PROMPT DELIVERY

PRODUCTION SET No. 1— 6 gages. Model A—range 0 to 3"...$34.83
PRODUCTION SET No. 2—10 gages. Model A—range 0 to 6"... 66.15
PRODUCTION SET No. 3—12 gages. Model C—range 0 to 3 1/16" 82.51
PRODUCTION SET No. 4—19 gages. Model C—range 0 to 5 11/16" 146.77



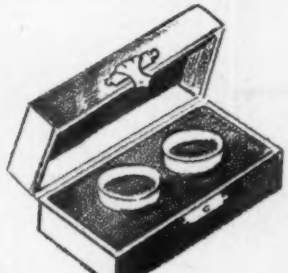
WILDER PROJECTOR for accurate measurement or comparing objects by means of a magnified shadow image.

SPENCER BINOCULAR MICROSCOPE with 3 dimensional vision, reveals surface finish imperfections, etc.



TOOLMAKER MICROSCOPE that simplifies the magnified projection of part profiles and provides direct measurement in two dimensions as well as angular measurements.

MAGNI-RAY—a wide field illuminated magnifier for close inspection of work and operations.



OPTICAL FLATS—for testing gages and lapped parts for parallelism and flatness.

GEORGE SCHERR CO.
INCORPORATED
200 LAFAYETTE STREET NEW YORK 13, N. Y.

"That KEMPSMITH Dealer Certainly Knows His Stuff"

"Whenever I have a machine tool servicing problem in my plant, I call in a Kempsmith distributor. I have the utmost confidence in him for he's as dependable as they make 'em, and certainly knows his stuff. Sure, I realize Kempsmith Milling Machines don't require much servicing, but at least it's a source of great satisfaction to know there's a distributor nearby who has both the ability and facilities to service all types of machine tools, should the occasion arise."

Exclusive KEMPSMITH Distributors:

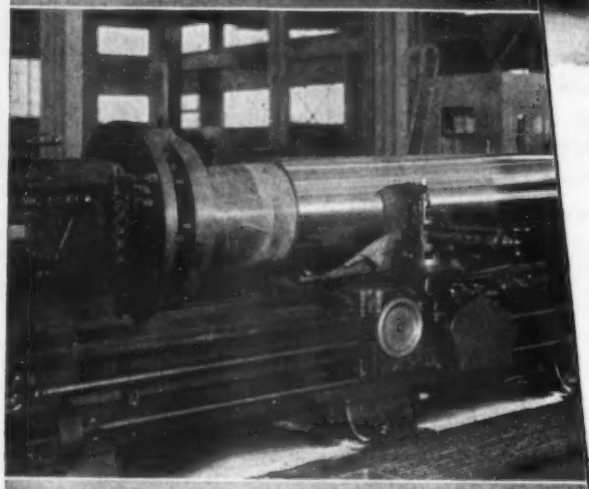
Akron, O.	Strong, Carlisle & Hammond Co.
Baltimore, Md.	Albert Hepworth Machine Tools
Boston, Mass.	Wigglesworth Machinery Co.
Binghamton, N. Y.	Syracuse Supply Co.
Buffalo, N. Y.	Syracuse Supply Co.
Chicago, Ill.	E. L. Essley Machinery Co.
Cleveland, O.	Strong, Carlisle & Hammond Co.
Columbus, O.	C. H. Gosiger Machinery Co.
Dallas, Texas	Hamilton-Huster Machinery Co.
Dayton, O.	C. H. Gosiger Machinery Co.
Detroit, Mich.	Strong, Carlisle & Hammond Co.
Grand Rapids, Mich.	E. L. Essley Machinery Co.
Indianapolis, Ind.	State Machinery Co.
Los Angeles, Calif.	Smith Booth Usher Co.
Milwaukee, Wis.	E. L. Essley Machinery Co.
Minneapolis, Minn.	The Satterlee Co.
Montreal, Que.	Moore Bros. Machinery Co., Ltd.
New York, N. Y.	Harrington-Wilson-Brown Co.
Philadelphia, Pa.	Albert Hepworth Machine Tools
Phoenix, Ariz.	Smith Booth Usher Co.
Rochester, N. Y.	Syracuse Supply Co.
Rock Island, Ill.	E. L. Essley Machinery Co.
St. Louis, Mo.	John W. Vogler Co.
Salt Lake City, Utah	The Lang Company
Seattle, Wash.	Buckner Weatherby Co., Inc.
San Francisco, Calif.	C. F. Bulotti Machinery Co.
Stamford, Conn.	Harrington-Wilson-Brown Co.
Syracuse, N. Y.	Syracuse Supply Co.
Toledo, O.	Strong, Carlisle & Hammond Co.
Toronto, Ont.	Rudel Machinery Co., Ltd.
Washington, D. C.	Albert Hepworth Machine Tools
Windsor, Ont.	Rudel Machinery Co., Ltd.

THE KEMPSMITH MACHINE CO., Milwaukee 14, Wis., U.S.A.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

Mr. Smith:
Thanks – this is what we mean by –
KEEP THAT GUARD UP!
J. Peterson



Isaacson Iron Works
Seattle

Mr. G. R. Shields,
Asst. Works Manager,
General Machinery Corp.,
Niles Tool Works Division,
Hamilton, Ohio.

Dear Rex:

We thought you would be interested in the performance of the five 36" Niles Time-Saver lathes which are installed here at our Plant No. 2 and have been operating for almost two years.

It is our firm belief that these five lathes have finished a greater number of tons of ship propulsion shafting in this emergency than any other five lathes in the world during their period of operation, and this statement is made comparing them with lathes of any size or weight manufactured.

They have finished hundreds of shafts weighing 12,000 pounds each and are now finishing shafts twenty-four hours a day which weigh from 23,000 pounds to 27,000 pounds each, and, honestly, when you see these huge shafts in these little 36" lathes the shafts look bigger than the lathes themselves.

They have been operated continuously twenty-four hours per day and seven days per week without one single replacement of parts, and the total number of shutdown hours for minor adjustments, etc. for the five lathes is 47 hours or an average of 9.4 hours per lathe since the beginning of operations.

If you are interested, with the Navy's approval we will have some photographs taken and send them to you.

Very truly yours,

ISAACSON IRON WORKS

H. W. Smith
Vice-President

HWS/I

GENERAL MACHINERY CORPORATION

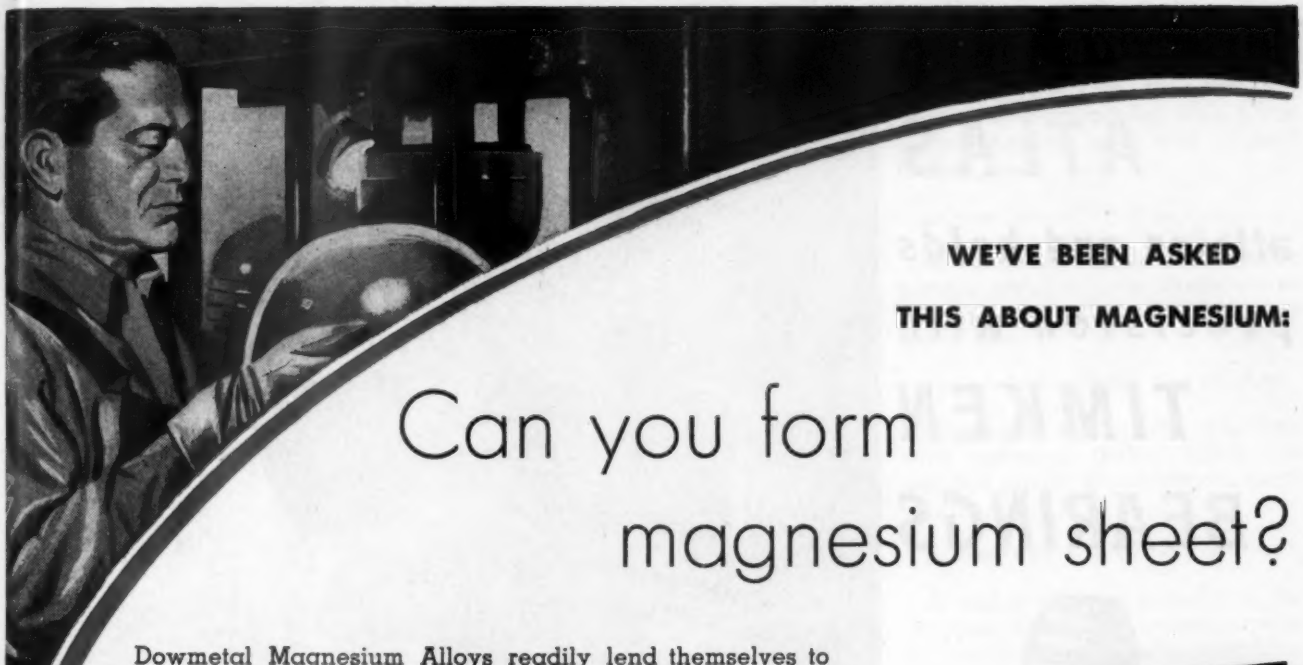
GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION



WE'VE BEEN ASKED

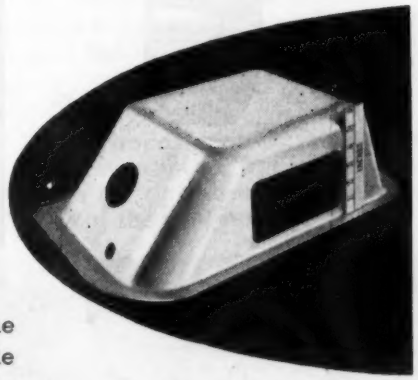
THIS ABOUT MAGNESIUM:

Can you form magnesium sheet?

Dowmetal Magnesium Alloys readily lend themselves to forming, bending and drawing operations. Wherever these fabrication techniques are used, in any field of manufacture where the high strength-weight ratio of the metal is a prime consideration, magnesium is peculiarly valuable.

Not only does it have excellent strength and elastic energy absorption qualities, but it is the lightest of all structural metals.

Dowmetal sheet can ordinarily be formed with the same equipment used for other metals, or with only minor die modifications. Hot forming is generally preferred in working Dowmetal as it permits deep draws in a single operation and eliminates the need of intermediate annealing; too, no allowance for springback is necessary. Cold forming is used for shallow draws and bends of reasonably generous radii.



Dow is currently producing for Bell Aircraft Corporation this weight-saving aircraft pedal-well

Those who have seen the broad scope of the research and quantity-production facilities at the Dow shops and foundry in Bay City, Michigan, know of the progress that has been made in the various methods of Dowmetal fabrication: in sand, permanent mold and die casting; extrusion; forging; sheet, plate and strip; in riveting and welding. In answering inquiries, Dow, as the pioneer and major producer of magnesium, offers the knowledge accumulated during 28 years of intensive research.

DOWMETAL *magnesium*

THE METAL OF MOTION

DOWMETAL

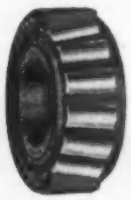
MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

ATLAS

attains and holds precision with TIMKEN BEARINGS



This Atlas 7" shaper is tiny as compared with a heavy-duty tool room machine—but in the important matter of precision can hold its own with any, for its spindle is mounted on Timken Tapered Roller Bearings, the same as an overwhelming majority of precision equipment of all kinds.

Thousands of these small machines — lathes as well as shapers — are engaged on important war work, with Timken Bearings keeping the spindles rigid and free from chatter; protecting them against radial, thrust and combined loads; and holding them in correct and constant alignment.

Make sure the bench machines you buy are Timken Bearing Equipped; then you will be sure of performance at its best. The Timken Roller Bearing Company, Canton 6, Ohio.

5TH WAR LOAN

Join the Fight

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

It is reported that:

The world's most powerful electric motor has recently been completed. Developing 7,000 horsepower at only 25 r.p.m., it is said to be capable of lifting an entire four stack destroyer at the rate of 200 feet per minute.

get ready with CONE for tomorrow

A new resin dip for small metal parts feels like rubber, protects the part, strips easily by hand and may be re-used.

get ready with CONE for tomorrow

A new invention consists of a panel that hangs over a bed and is a source of radiant energy. Properly adjusted to the sleeper's metabolism and length of slumber, it is expected to give him the equivalent of a full night's sleep in as little as two hours.

get ready with CONE for tomorrow

The rare metal, indium, is being used as a tarnish-proof plating for gold and silver and is being used as an alloy in bearing metal and solder.

get ready with CONE for tomorrow

A new chemical does most of the work of the dangerous hydrofluoric acid without danger to the human skin.

get ready with CONE for tomorrow

The new plastic-coated fabrics will be water-proof and abrasion-resistant and may be flexed for a long time before cracking. They will be useful materials for baby carriages, auto tops, furniture, bus seats, shoe tips, raincoats, luggage, shower curtains and handbags.

get ready with CONE for tomorrow

Even the high-pressure cylinders used to hold compressed gases are now being made by stamping and drawing.

get ready with CONE for tomorrow

A colored surface .0001 inch thick, applied to the surfaces of gages does not affect their accuracy, but warns of wear by a change in color.

A national producer's council hopes to reduce the cost of home building by 20% by promoting more modern building codes and labor regulations.

get ready with CONE for tomorrow

The by-products of sawdust have become so valuable that some sawmills are using coal for fuel.

get ready with CONE for tomorrow

A prominent scientist states that it may take twenty years to utilize fully the scientific discoveries made since Pearl Harbor.

get ready with CONE for tomorrow

A synthetic shellac made from corn is expected to permanently replace the natural product which is made from the secretions of an insect found in India.

A large manufacturer of farm machinery proposes to enter the peace-time farm market with a line of refrigerators and cold storage lockers.

get ready with CONE for tomorrow

A new low-temperature grease permits aerial cameras to operate at temperatures as low as 100 degrees below zero.

get ready with CONE for tomorrow

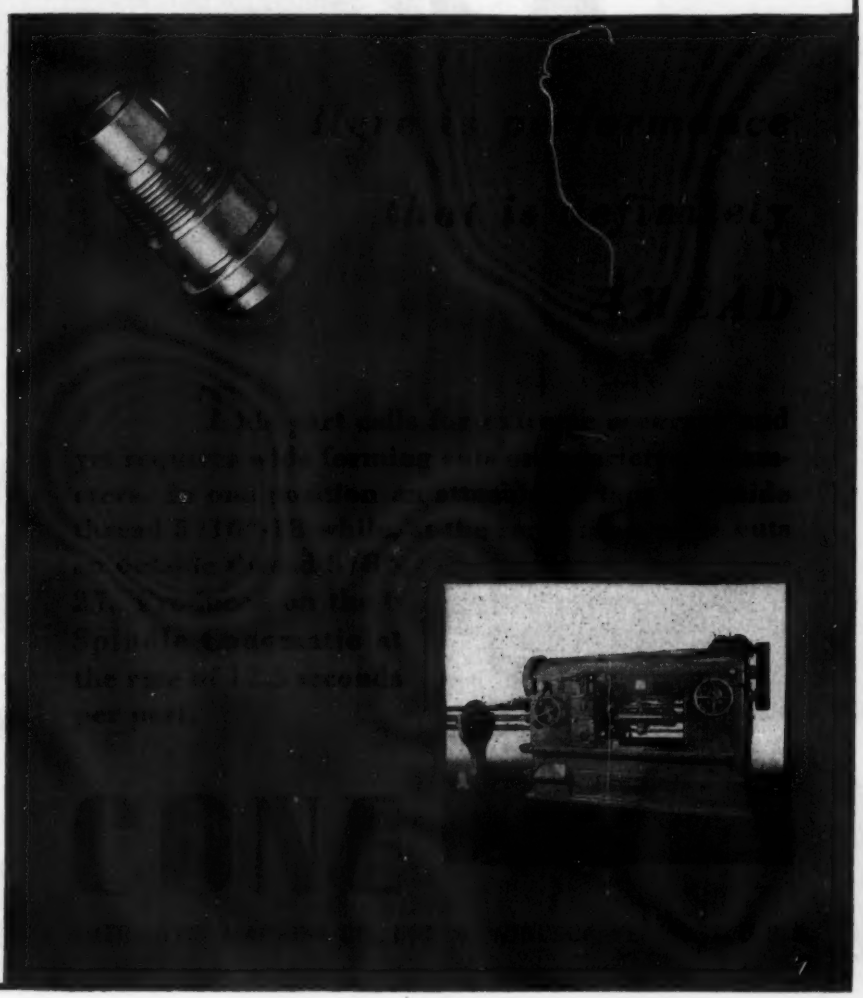
A French automobile manufacturer expects to make a small, economical car for the American post-war market.

get ready with CONE for tomorrow

A maker of paper parachutes, for dropping supplies to troops, expects to continue their manufacture after the war for use in the air delivery of mail and light-weight express.

get ready with CONE for tomorrow

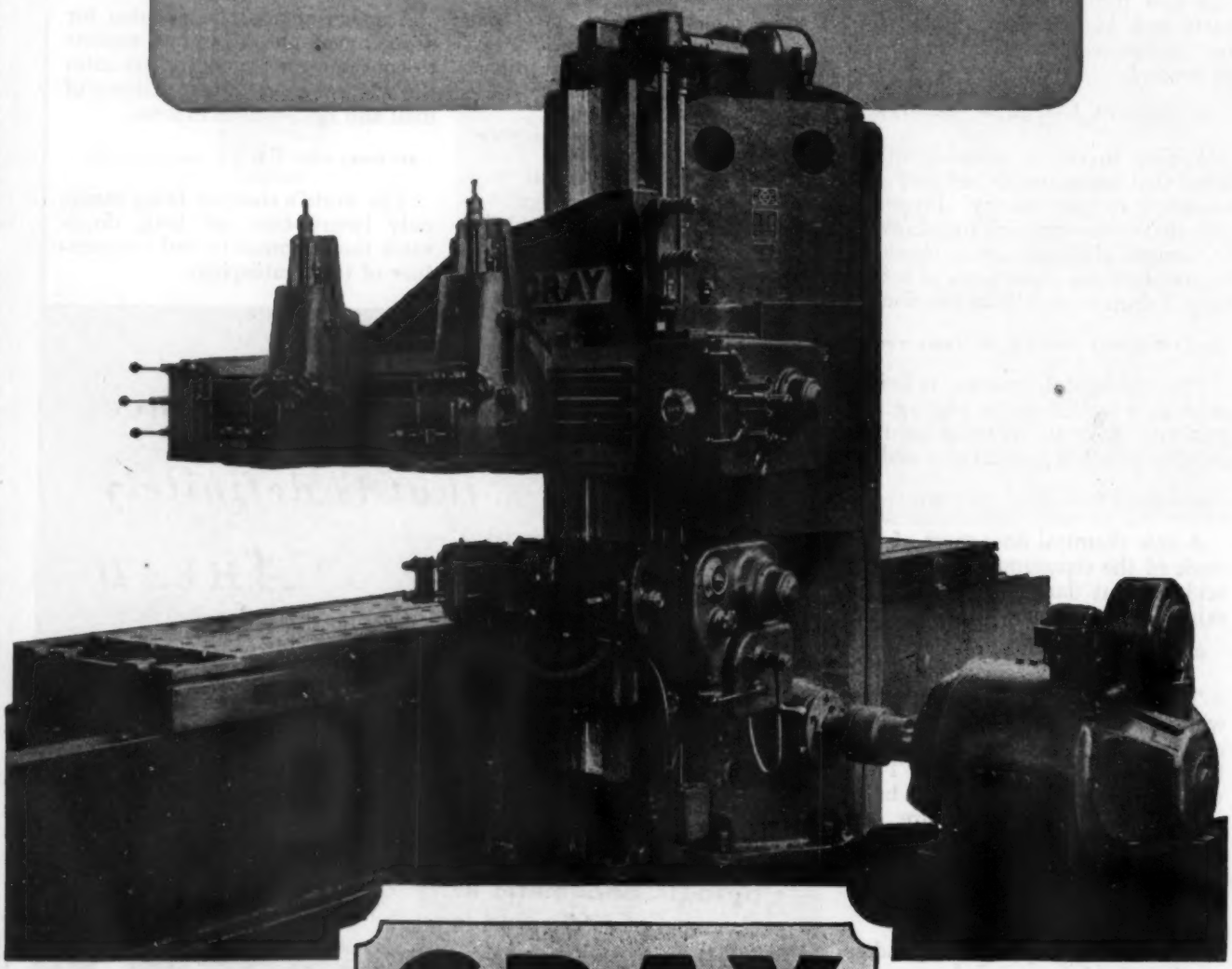
The world's shortest firing range, only twenty-two feet long, duplicates the air pressure and temperature of the stratosphere.



SMALL but RUGGED

● Gray Openside Planers are built not merely for odd jobs and rough work but to take heavy cuts and still maintain close tolerances on fine work. The triangular column provides stiffness again twisting strains—the bed with four heavy vertical walls and cast solid across the bottom under the gears—the table of box section all assure the utmost rigidity and accuracy. Built in sizes from 36" to 120".

Write for full descriptive circular.



GRAY

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE—Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines

Engineered

Circular Form Tools
for
Brown & Sharpe Machines

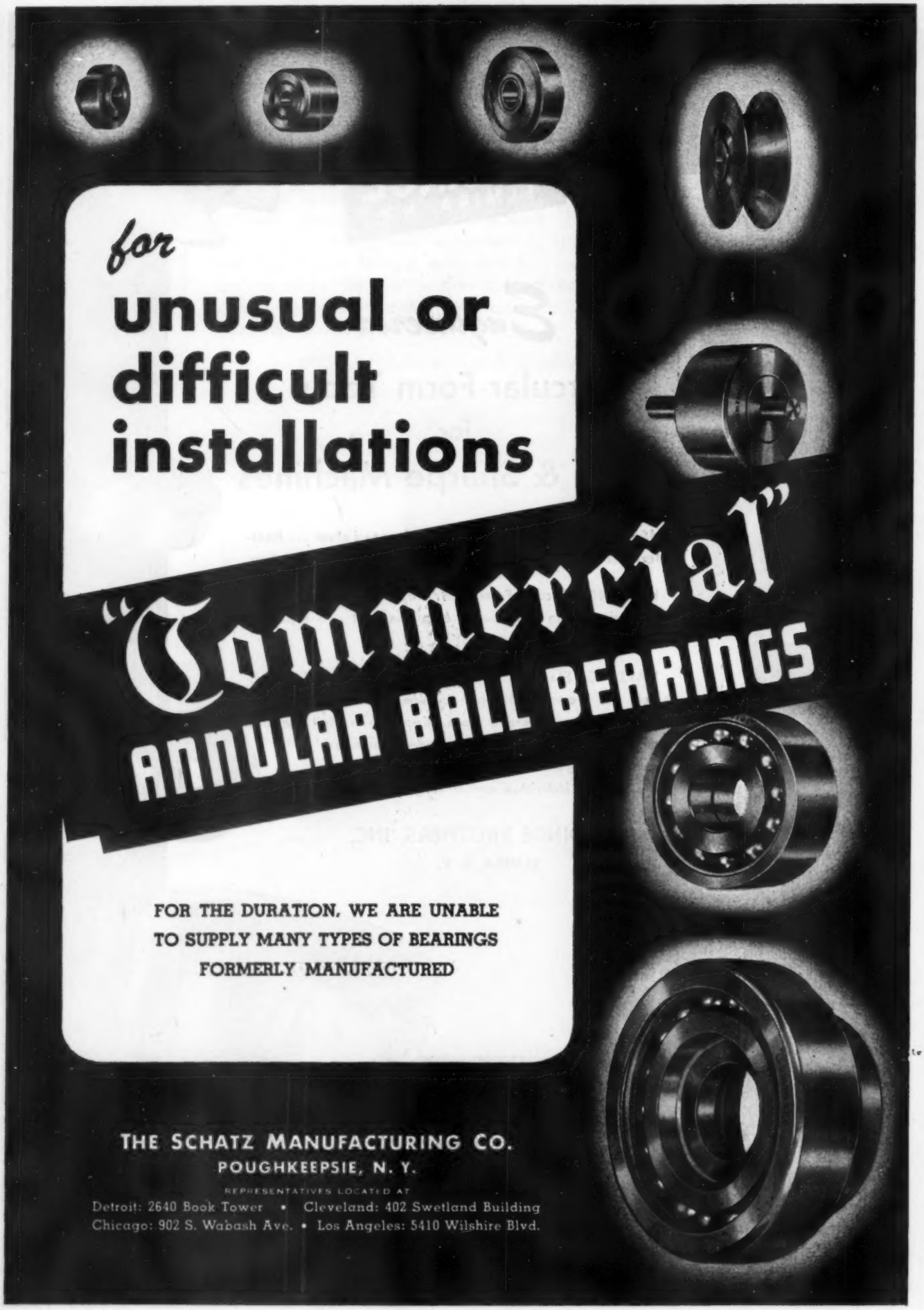
HARDINGE accuracy . . . special high speed steel . . . heat-treatment and ground finish assure proper part production.

HARDINGE Circular Form Tools are manufactured to your blueprint of the form tool or to a blueprint of the part to be produced.

HARDINGE Standard Circular Cut-off Tools are also available for Brown & Sharpe machines with varying blade thickness for different stock diameters or full machine capacity. These tools are threaded, hardened, ground and gashed . . . ready for use . . . and are packaged in individual containers.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

COLLETS – FEED FINGERS – PADS – FORM TOOLS
FOR ALL MAKES OF AUTOMATICS, CHUCKING MACHINES AND TURRET LATHES


for
unusual or
difficult
installations
"Commercial"
ANNULAR BALL BEARINGS
FOR THE DURATION, WE ARE UNABLE
TO SUPPLY MANY TYPES OF BEARINGS
FORMERLY MANUFACTURED
THE SCHATZ MANUFACTURING CO.
POUGHKEEPSIE, N. Y.
REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building
Chicago: 902 S. Wabash Ave. • Los Angeles: 5410 Wilshire Blvd.

"THE TOOLS YOU BUY AGAIN" . . .
UNION
For large, deep-hole drilling, . . for delicate and small-hole drilling . . standardize with Union Twist Drills! They're the drills for uniform precision performance on every type of "hole" job. In addition, the complete Union Line of milling cutters, hobs, saws, reamers, end mills, taps and dies enables you to be sure of all 'round precision and dependability for practically every wartime machining operation. Once used, Union Tools are "the Tools you buy again."
Union Twist Drill Co.
Athol, Mass.
S.W.Card
Butterfield
UNION
TWIST DRILL COMPANY

Butterfields!

For **REAMERS** geared to today's heavy high production demands . . . for TAPS that can take on the tough threading assignments of precision war production and deliver the maximum service on every tapping job, whatever the machine, the material or the degree of accuracy required . . . use BUTTERFIELDS and be assured of top results in the quickest time!

S.W.Card
Butterfield
UNION

Butterfield Division
Derby Line, Vt. *Rock Island, Que.*

DIVISIONS OF THE UNION

BUY "CARD"

-here's why!

Seventy years of specialized experience with tapping problems enables Card to give you authoritative recommendations on every phase of thread production. Also — Card produces and stocks a thoroughly complete line . . the proper Tap for any job. This results in the right combination — prevents costly delays and inaccuracies. Play safe . . buy "CARD"!

S. W. Card Mfg. Co.
Mansfield, Mass.

S.W.Card
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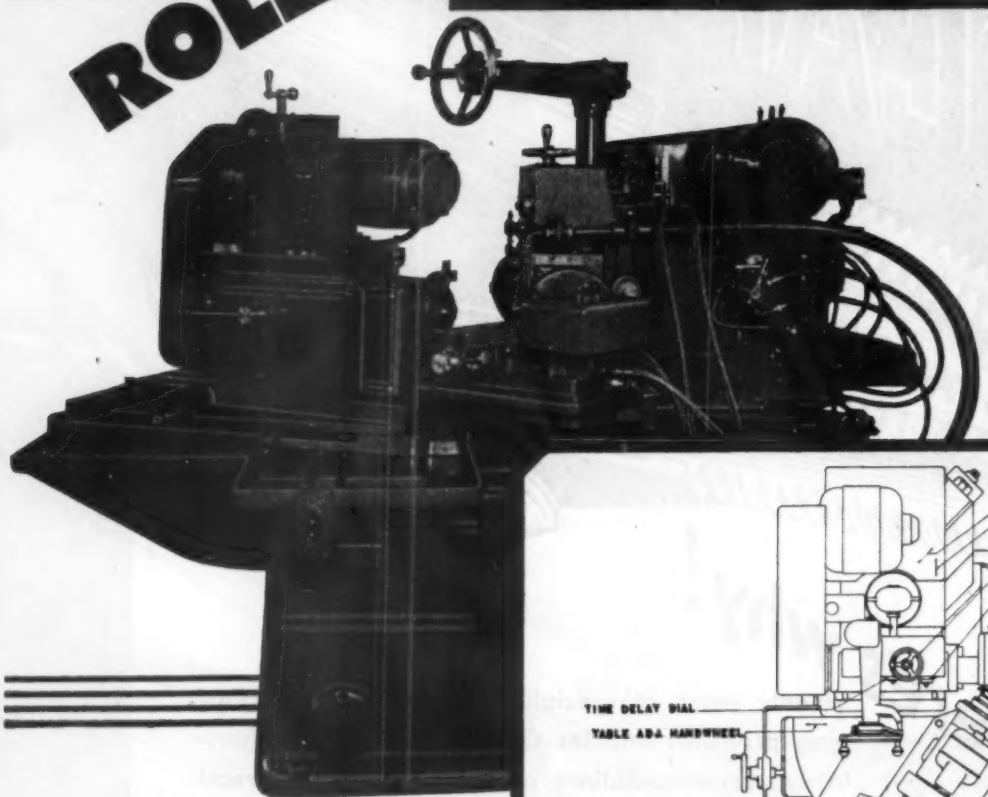
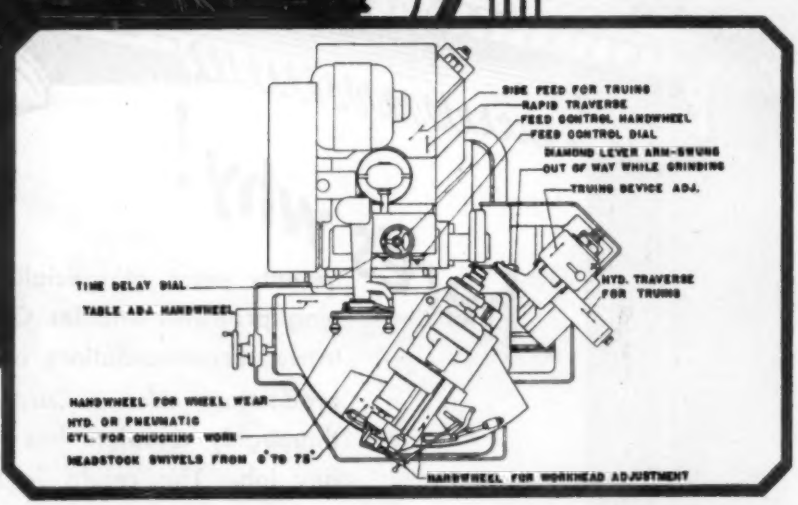
UNION

TWIST DRILL COMPANY

GRIND ROLLER BEARING RACES ON A FITCHBURG




SIDE FEED FOR TRUING
RAPID TRAVERSE
FEED CONTROL HANDWHEEL
FEED CONTROL DIAL
DIAMOND LEVER ARM-SWUNG OUT OF WAY WHILE GRINDING
TRUING DEVICE ADJ.
HYD. TRAVERSE FOR TRUING
TIME DELAY DIAL
TABLE ADJ. HANDWHEEL
HANDWHEEL FOR WHEEL WEAR
HYD. OR PNEUMATIC CYL. FOR CHUCKING WORK
HEADSTOCK SWIVELS FROM 0° TO 75°
HANDWHEEL FOR WORKHEAD ADJUSTMENT

...and other Chucking Grinding Operations

THE latest Fitchburg Roller Bearing Race Grinder employs a single standard Fitchburg Bowgage Grinding Wheelhead Unit. The workhead is adjustable from 0 degrees to 75 degrees so that the machine can be used for many other straight or taper grinding jobs.

The Fitchburg Roller Bearing Race Grinder is completely automatic. By pressing a single button the wheelhead goes through its standard automatic cycle — rapid traverse to the work, proper grinding feed, spark-out time, and rapid return. Work is held to limits of .0002" in production.

The workhead can be arranged either hydraulically or pneumatically for collet clamping or other chucking devices.

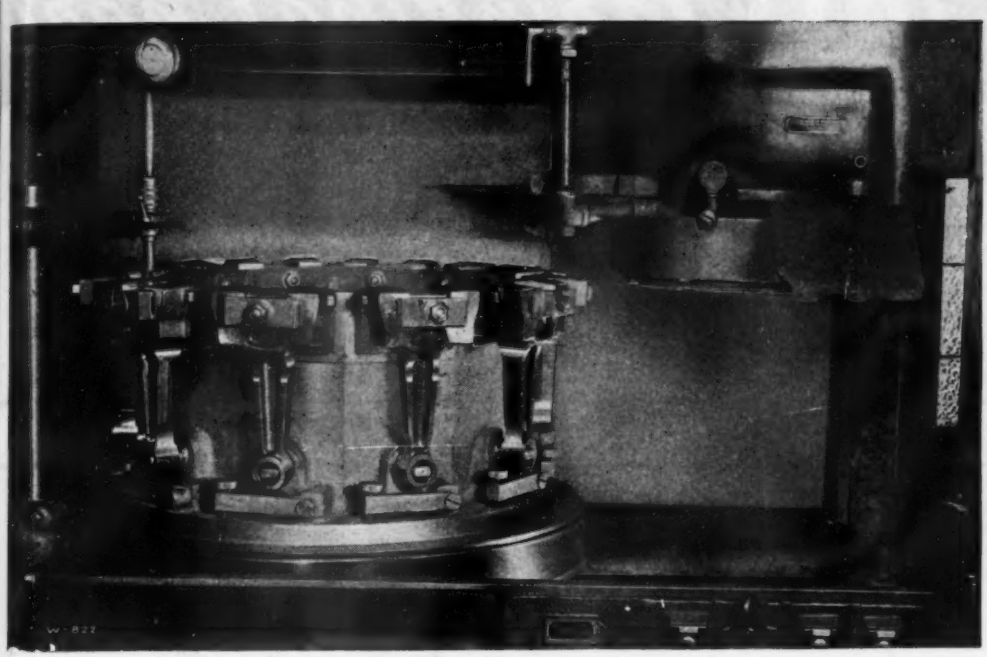
In this taper grinding application, the wheelhead is mounted on a 45° slide for trueing. The trueing device is mounted on the side of the base parallel to the wheelhead, and is hydraulically operated for trueing, with micrometer adjustment for positioning.

For grinding roller bearing races a Fitchburg grinds them faster and more accurately than other methods. A leading American manufacturer reports enthusiastically on the quality and low production cost of this machine. Write us today for complete information.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders



The advantages of BLANCHARD *grinding*

★*Production*

★*Adaptability*

Fixture Saving

★*Operation Saving*

Material Saving

Fine Finish

★*Flatness*

Close Limits

★*Production* ★*Adaptability* ★*Operation Saving* ★*Flatness*

Grinding Nickel Steel Forgings

These are master rods for an 1830 H.P. radial engine.

Formerly they were milled and finish-ground, one at a time, at the rate of 15 to 20 minutes each.

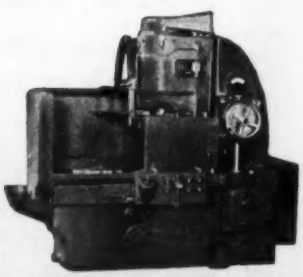
Now they are ground, 10 at a time in a special fixture, on the No. 18 Blanchard Surface Grinder which removes 3/8" of metal and turns them out at the rate of 4 minutes each.

This is only one of the many airplane engine parts that are being ground on the Blanchard, using magnetic, hand-clamping or automatic fixtures.

"Put it on the Blanchard"

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



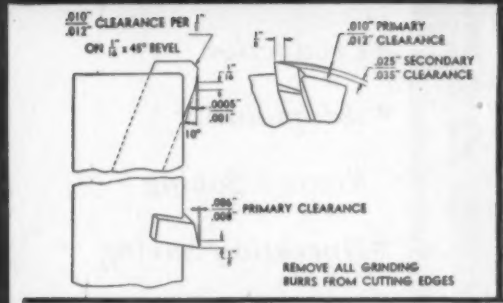
This job being done on the No. 18 Blanchard Surface Grinder

The BLANCHARD MACHINE COMPANY

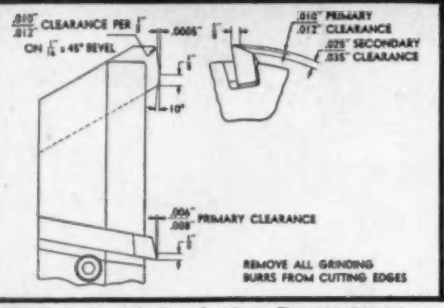
64 STATE STREET, CAMBRIDGE, MASS., U. S. A.

INGERSOLL *Grinding Chart*

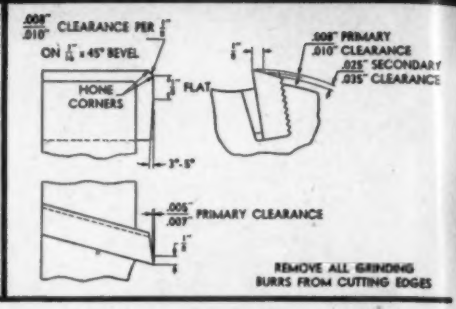
BASIC GRINDS FOR STANDARD CUTTERS


.010" / .012" CLEARANCE PER ⅛" ON ⅛" x 45° BEVEL
.010" PRIMARY .012" CLEARANCE
.025" SECONDARY .035" CLEARANCE
.0005" .001"
10°
.006" .008" PRIMARY CLEARANCE
REMOVE ALL GRINDING BURRS FROM CUTTING EDGES

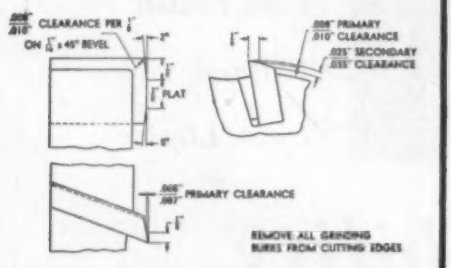
GRIND 1. Rough Milling Cast Iron.


.010" / .012" CLEARANCE PER ⅛" ON ⅛" x 45° BEVEL
.0005"
.010" PRIMARY .012" CLEARANCE
.025" SECONDARY .035" CLEARANCE
10°
.006" .008" PRIMARY CLEARANCE
REMOVE ALL GRINDING BURRS FROM CUTTING EDGES

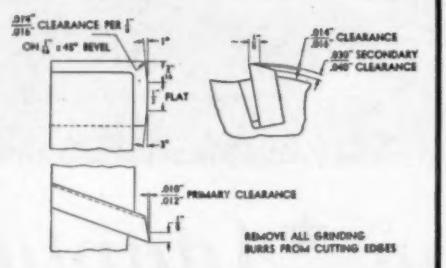
GRIND 2. Finish Milling Cast Iron. The .0005" high heel may have to be changed to suit the tilt of the spindle. This can be determined from the finished surface.


.008" / .010" CLEARANCE PER ⅛" ON ⅛" x 45° BEVEL
HONE CORNERS
FLAT
3°-5°
.008" PRIMARY .010" CLEARANCE
.025" SECONDARY .035" CLEARANCE
.005" .007" PRIMARY CLEARANCE
REMOVE ALL GRINDING BURRS FROM CUTTING EDGES

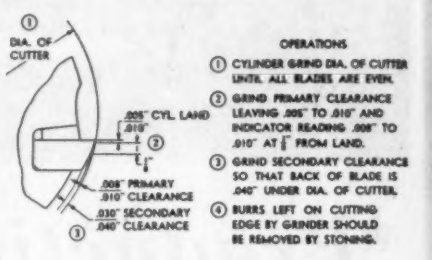
GRIND 3. Rough Milling Low Carbon Steel.


.008" / .010" CLEARANCE PER ⅛" ON ⅛" x 45° BEVEL
2°
FLAT
5°
.008" PRIMARY .010" CLEARANCE
.025" SECONDARY .035" CLEARANCE
.006" .007" PRIMARY CLEARANCE
REMOVE ALL GRINDING BURRS FROM CUTTING EDGES

GRIND 4. Finish Milling Low Carbon Steel. If chatter is encountered, reduce the length of flat on face.

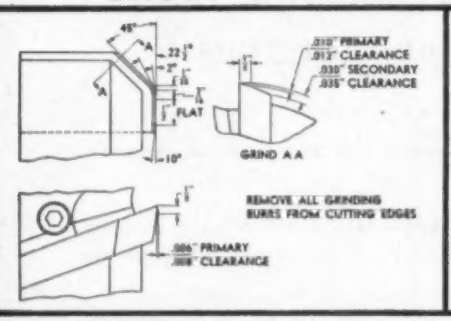

.014" / .016" CLEARANCE PER ⅛" ON ⅛" x 45° BEVEL
1°
FLAT
3°
.014" CLEARANCE .016"
.030" SECONDARY .040" CLEARANCE
.010" / .012" PRIMARY CLEARANCE
REMOVE ALL GRINDING BURRS FROM CUTTING EDGES

GRIND 5. Rough and Finish Milling Aluminum. Hone to a keen smooth cutting edge.

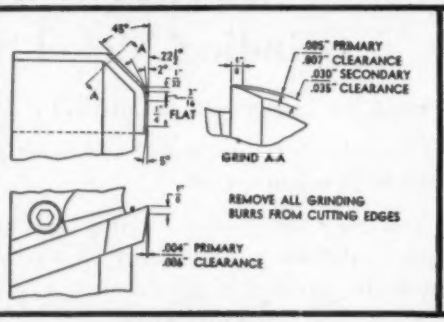

① DIA. OF CUTTER
.005" CYL. LAND .010"
② .008" PRIMARY .010" CLEARANCE
.030" SECONDARY .040" CLEARANCE
③
OPERATIONS
① CYLINDER GRIND DIA. OF CUTTER UNTIL ALL BLADES ARE EVEN.
② GRIND PRIMARY CLEARANCE LEAVING .005" TO .010" AND INDICATOR READING .008" TO .010" AT ⅛" FROM LAND.
③ GRIND SECONDARY CLEARANCE SO THAT BACK OF BLADE IS .040" UNDER DIA. OF CUTTER.
④ BURRS LEFT ON CUTTING EDGE BY GRINDER SHOULD BE REMOVED BY STONING.

GRIND 6. Helical Slab Milling Cutter.

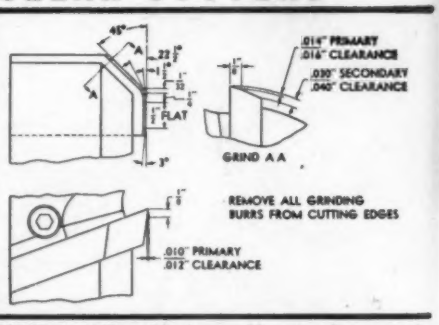
BASIC GRINDS FOR INGERSOLL SHEAR CLEAR CUTTERS



GRIND 7. Milling Cast Iron.



GRIND 8. Milling Steel.



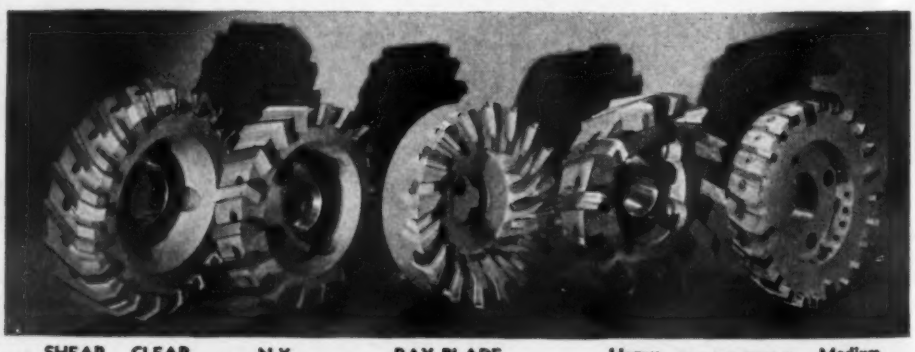
GRIND 9. Milling Aluminum. Hone to a keen smooth cutting edge.

NOTE: *Copies of these charts, suitably mounted for hanging in your tool room, are available upon request.*

To obtain best results with your milling cutters it is essential that they be properly ground. Minor variations may be necessary to suit particular conditions, but satisfactory results will be obtained if cutters are ground in accordance with these charts.

For further information on the technique of grinding milling cutters write for Ingersoll Bulletin No. 54 describing the Ingersoll Cutter Grinder.

Ingersoll manufactures inserted blade milling and boring tools of all types. These are shown in our Engineering Specification Sheets available on request.



SHEAR CLEAR NX RAY BLADE Heavy CONE TYPES Medium

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

48 hours on the time card

...but 77¾ hours in production results

873 MARATHON C-6 THREAD GRINDING OIL STEPPED UP PRODUCTION ON ONE MACHINE FROM 69 TO 111 UNITS PER HOUR ... AN INCREASE OF 62%

Finish was improved, work speed of the machine increased 100% and running time between wheel dressings was 80% longer!

Anti-stain, Anti-foam. Without sacrifice of coolant or lubricating superiority, 873 Marathon C-6 has marked anti-stain, anti-foam characteristics.

No Smoke. 873 Marathon C-6 operates at lower working temperatures, promotes greater accuracy and longer tool life. There's no smoke, no thread burning, no welding of chips.

Transparent. Operators can read a scale through 873 Marathon C-6, make on-the-job adjustments. No fog ... and it *stays* clear, does not sludge in use.

Get the Facts on the use of 873 Marathon C-6 in your thread grinding operations. An Ohio Oil Company lubrication engineer will be glad to *specify this and other cutting and grinding oils for your machines and jobs* for greater production volume with finer finishes. Write, wire or phone.

A Complete Line of Cutting and Grinding Oils for Every Metal Working Operation

MARATHON

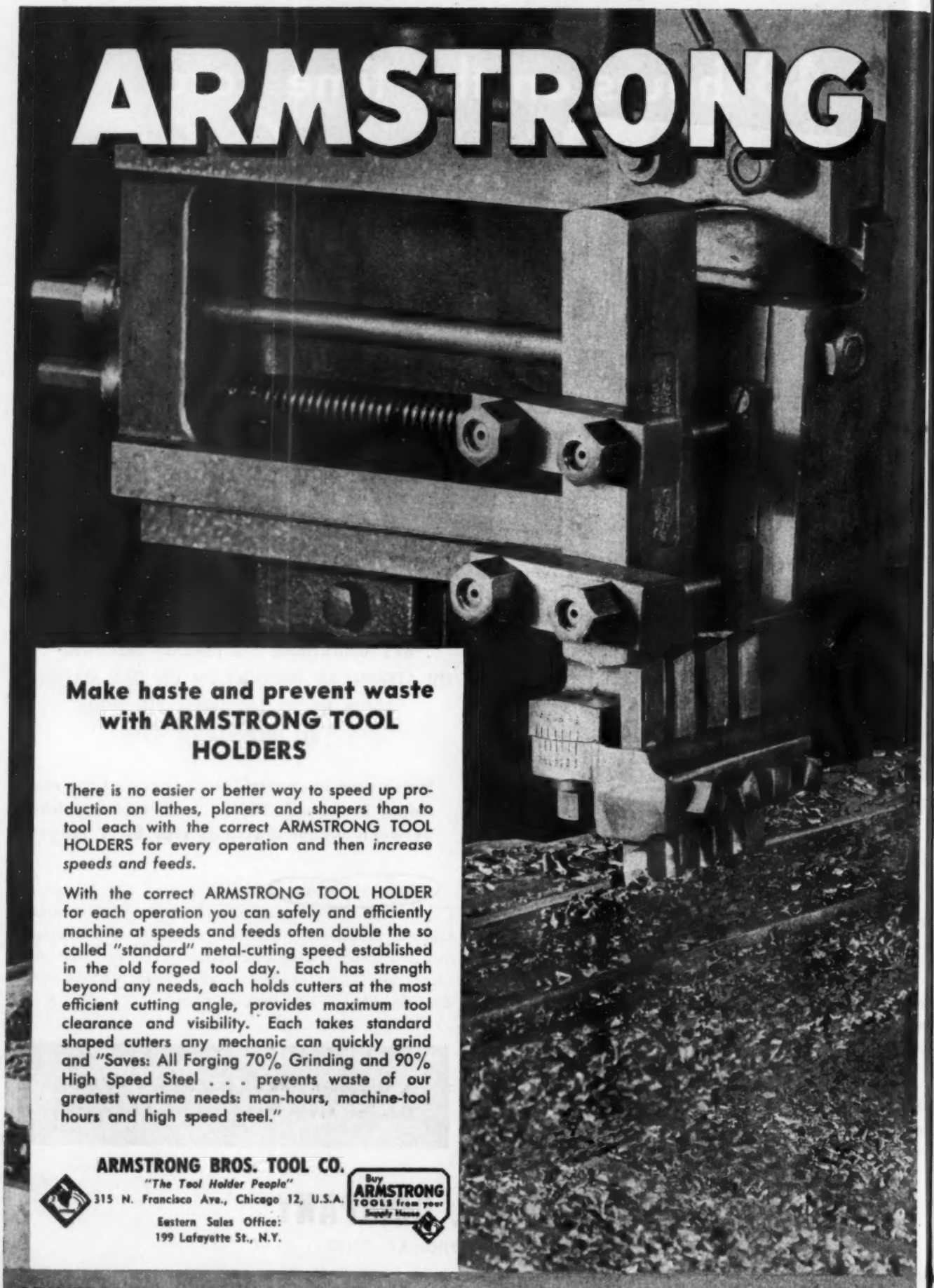
The OHIO OIL COMPANY

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

PRODUCERS OF PETROLEUM SINCE 1887

ARMSTRONG



Make haste and prevent waste with ARMSTRONG TOOL HOLDERS

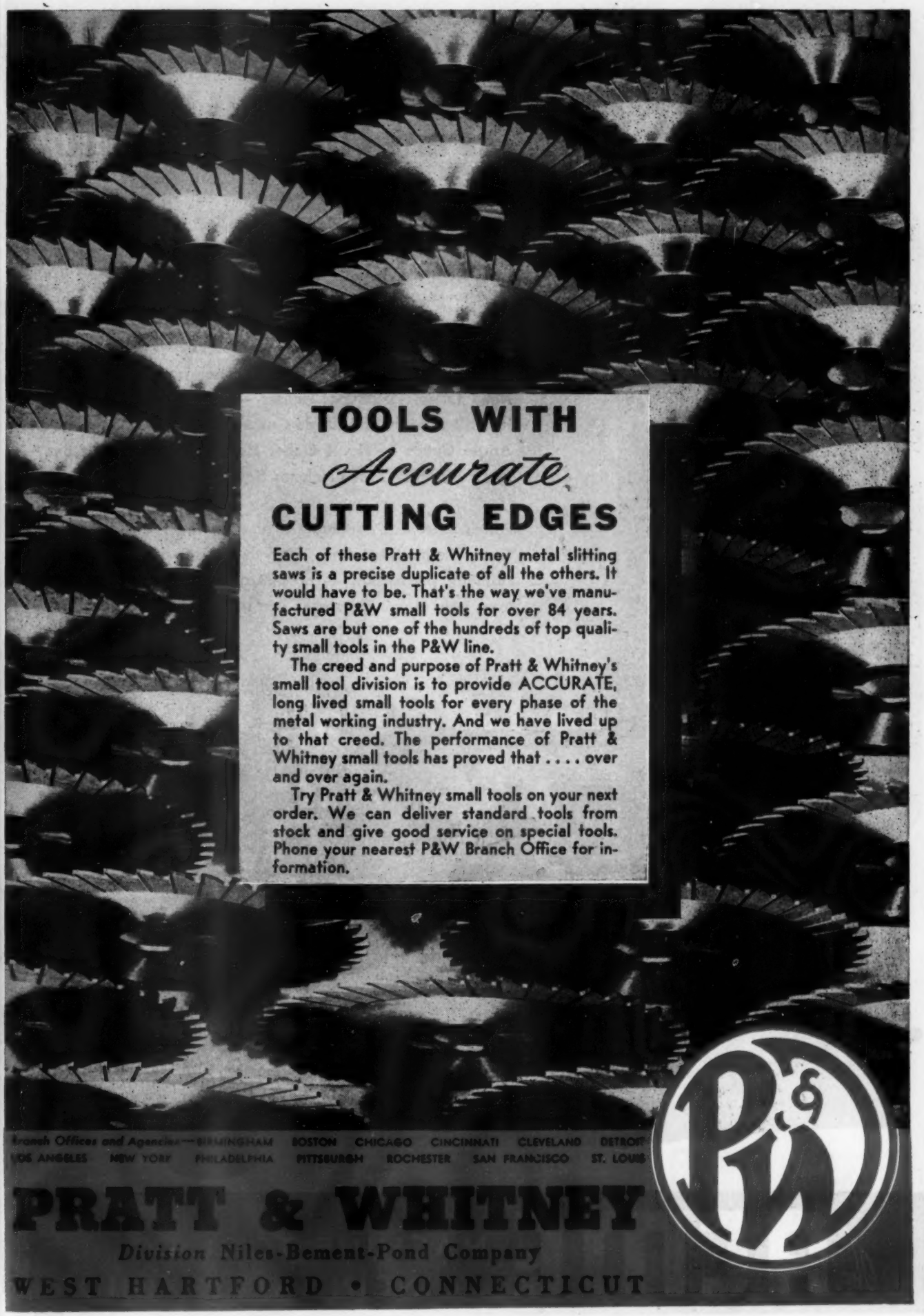
There is no easier or better way to speed up production on lathes, planers and shapers than to tool each with the correct ARMSTRONG TOOL HOLDERS for every operation and then *increase speeds and feeds.*

With the correct ARMSTRONG TOOL HOLDER for each operation you can safely and efficiently machine at speeds and feeds often double the so called "standard" metal-cutting speed established in the old forged tool day. Each has strength beyond any needs, each holds cutters at the most efficient cutting angle, provides maximum tool clearance and visibility. Each takes standard shaped cutters any mechanic can quickly grind and "Saves: All Forging 70% Grinding and 90% High Speed Steel . . . prevents waste of our greatest wartime needs: man-hours, machine-tool hours and high speed steel."

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Sales Office:
199 Lafayette St., N.Y.

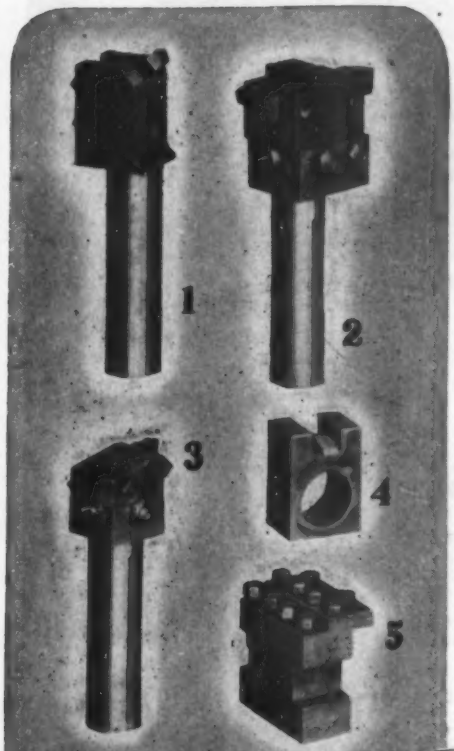
Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms


TOOLS WITH
Accurate
CUTTING EDGES
Each of these Pratt & Whitney metal slitting saws is a precise duplicate of all the others. It would have to be. That's the way we've manufactured P&W small tools for over 84 years. Saws are but one of the hundreds of top quality small tools in the P&W line.
The creed and purpose of Pratt & Whitney's small tool division is to provide ACCURATE, long lived small tools for every phase of the metal working industry. And we have lived up to that creed. The performance of Pratt & Whitney small tools has proved that . . . . over and over again.
Try Pratt & Whitney small tools on your next order. We can deliver standard tools from stock and give good service on special tools. Phone your nearest P&W Branch Office for information.
Branch Offices and Agencies—BIRMINGHAM BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT
LOS ANGELES NEW YORK PHILADELPHIA PITTSBURGH ROCHESTER SAN FRANCISCO ST. LOUIS
PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD • CONNECTICUT

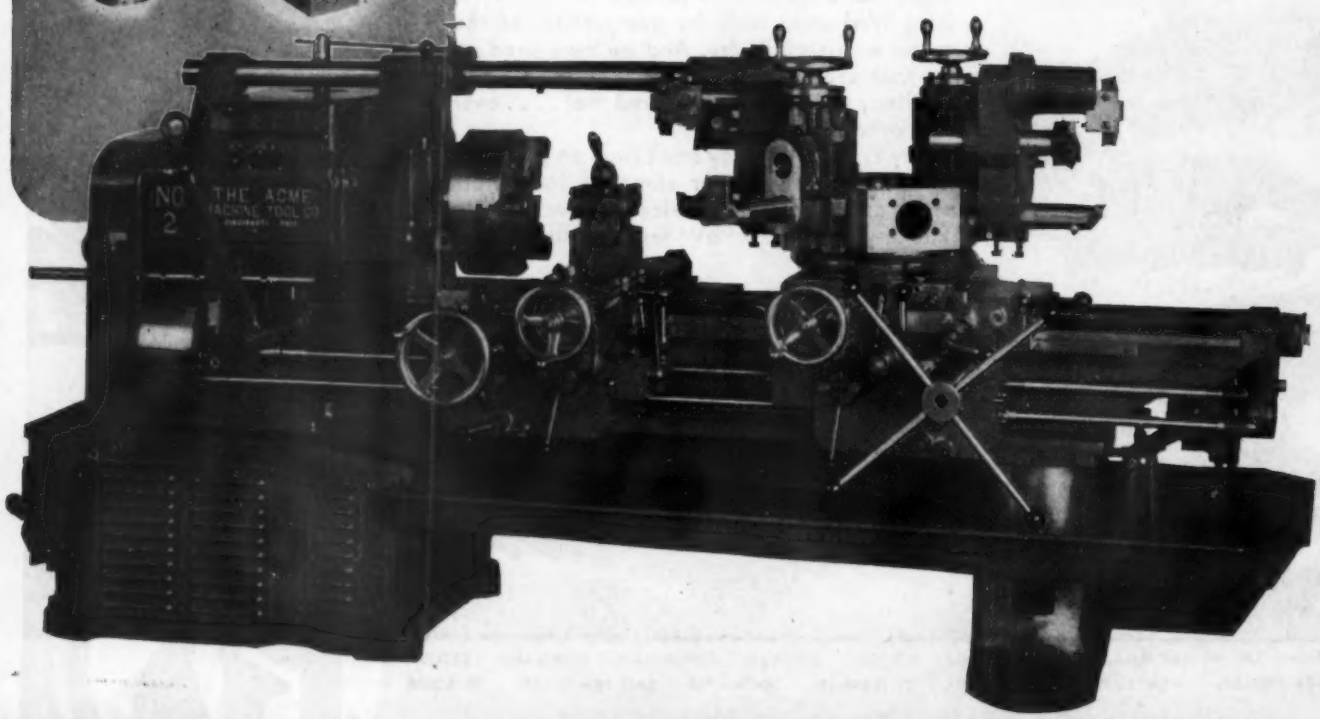
Heavy Duty Tools for Capacity Production

Cincinnati **ACME** Turret Lathes

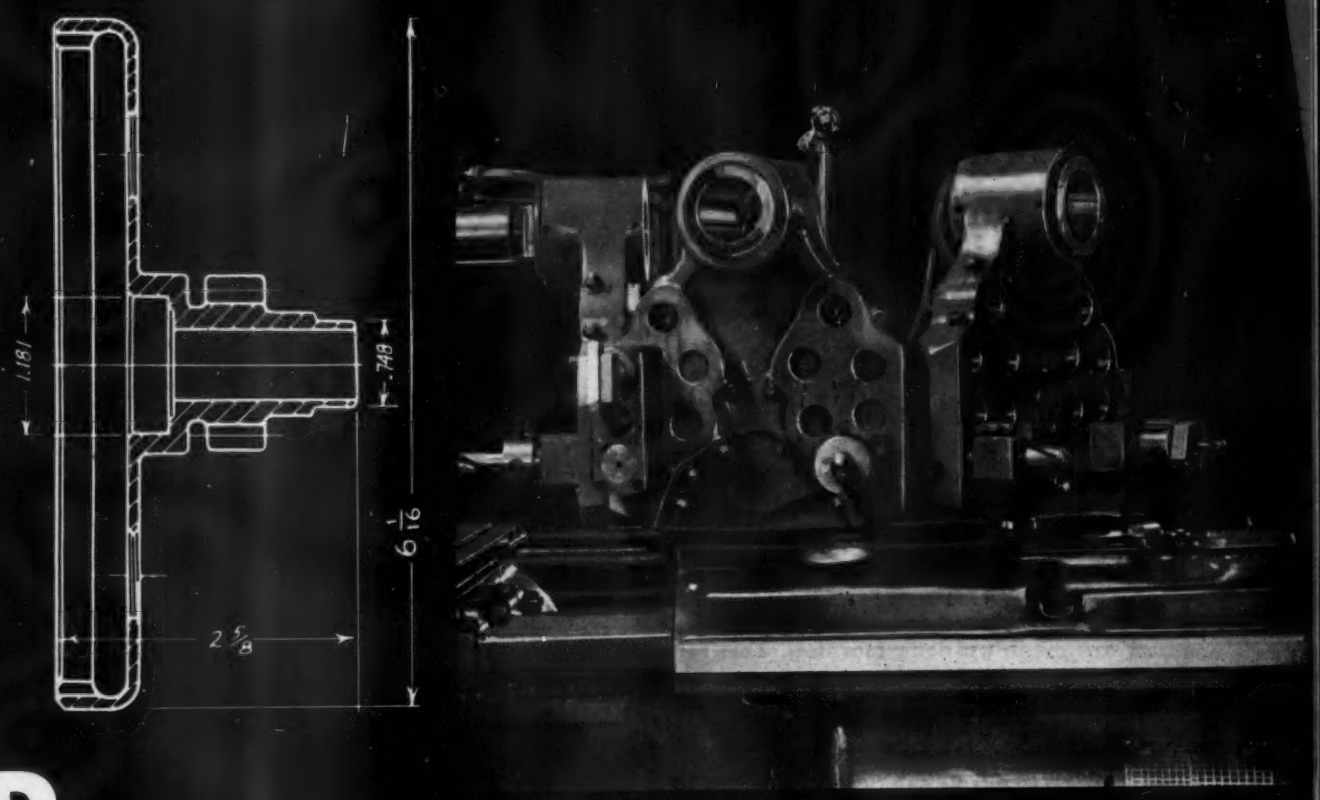


● One of the main production factors of a turret lathe lies in the heavy duty tools it is capable of handling. This Cincinnati Acme Universal Turret Lathe is designed and built to accommodate the heavy duty tools required today. The group shown is typical of the heavy duty cutter holders needed to obtain the high speeds and heavy feeds demanded of carbide tipped cutting tools. The group consists of — No. 1 Offset "X" Cutter Holder — No. 2 Reversible and Adjustable Straight and Angle Cutter Holder — No. 3 Adjustable Angle Cutter — No. 4 Cutter Head for Stub Boring Bar — No. 5 Multiple Tool Block for Square Turret.

All of these are adaptable to use on the 1-S and 2-S Acme Turret Lathe illustrated. Use these Heavy Duty Tools for capacity production — consistent accuracy — lower costs from your Acme Universal Turret Lathes.



...The ACME MACHINE TOOL CO. ... CINCINNATI 32, OHIO.



RE-TOOLING *by* P&J PROTECTS YOUR ORIGINAL INVESTMENT *in* LOW COST PRODUCTION

Originally tooled for gear blanks

The P&J 5-D-2 (two spindle) 12" Automatic provides the means of handling either two identical operations simultaneously or two entirely different operations. Set-up for rough and finish machining the gear blank illustrated, this machine demonstrated its high efficiency and production with an exceptional degree of accuracy.

...but with re-tooling possibilities for other work

Owners of P&J Automatic Chucking Equipment made a wise investment in their original purchase of P&J equipment. They bought not only the special tooling they needed for a specific job (such as the one illustrated here) but also the *tooling possibilities* for other work. By the comparatively simple procedure of re-tooling, their P&J machines may be converted to handle other jobs and other operations, but with all inherent conveniences, efficiencies and accuracy of original machines maintained intact.

An investment in RE-TOOLING will enable you to handle future work economically and derive further worthwhile returns from your investment in P&J equipment. Our engineers and the facilities of our shop are at your service.

POTTER & JOHNSTON MACH. CO., *Pawtucket, R. I.*

P & J
Rebuilding Service

Restoration of present P&J machines to their original accuracy and productivity through rebuilding in our plant is available to owners of P&J equipment. Re-tooling can be handled also at the same time, if desired. Investigate.

BUY BONDS *and* SAVE LIVES

"TALON'S 'SAME-DAY' *Service* on Tubing Inquiries will conserve YOUR TIME..

● "When you contact us, we ACT.

"The Production Department is adjacent to the Sales Department—The Works' Manager and Engineers' Office but two doors away... up to the minute steel inventories and schedules are made up each morning. This setup makes it possible to answer questions while you are on the wire or at the most in a few hours instead of waiting days for an answer. Most of the time we CAN give you an immediate answer. In any event, you get your information the same day so that YOUR Time, today's most valuable commodity, is not wasted.

"Our closely knit, experienced, tube-specialist organization is geared to 'Personalized' service.

"Send for our booklet introducing our personnel, many of whom you probably know, whose collective experience totals 109 years."

Robert Campbell
SALES MANAGER

Address Your Inquiries to:
Talon, Inc., Steel Tube Division
Oil City, Pa.

THOROUGH TESTING

Talon has complete facilities for testing Talon's Tubing so that we can meet your particular specifications.

Flattening, flaring, flanging, and crushing tests are made constantly to insure uniform quality.

Talon manufactures electric welded steel tubing in all sizes between 5/8" O.D. and 4" O.D. and in any length up to 40 feet. Remember Talon's "SAME-DAY" service on inquiries and "ON-TIME" delivery when you need tubing.

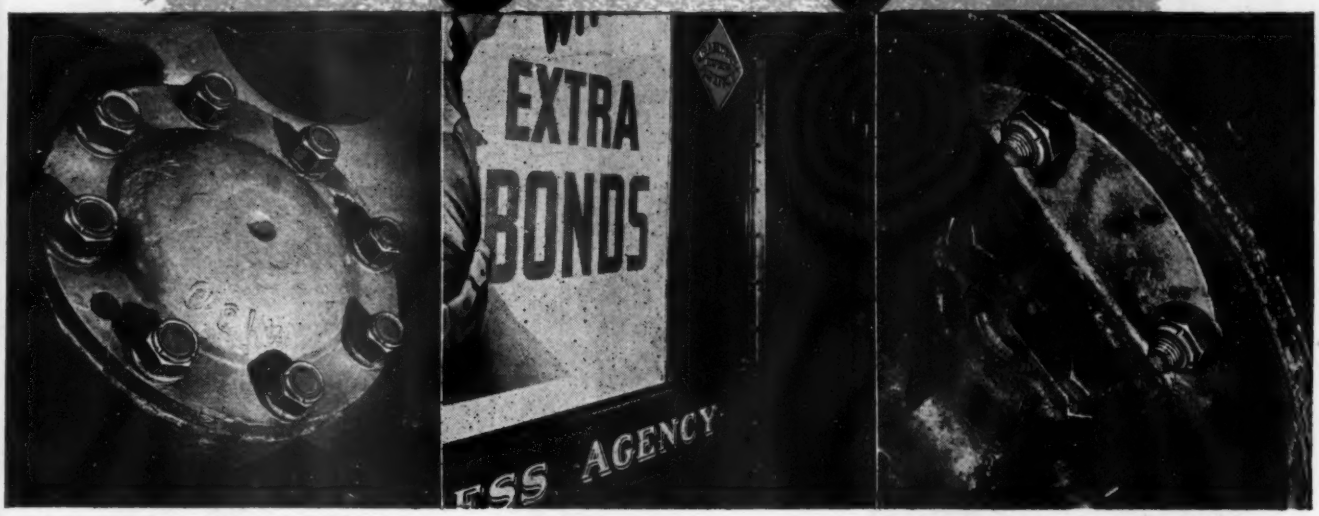
PRESSURE AND MECHANICAL

TALON . . INC.

SIZES FROM $\frac{5}{8}$" O.D. TO 4" O.D. UP TO 40' IN LENGTH

STEEL TUBE DIVISION — OIL CITY, PENNA.

HOW TO KEEP 15,000 TRUCKS ON THE GO



These Elastic Stop Nuts are holding the driving flange. Even with frequent starts and stops, and the steady use the wheels of an express truck get, these nuts hold fast.

Railway Express truck bodies are completely fastened with Elastic Stop Nuts. Where other fastenings give with the sway and twist of the truck, these nuts hold tight.

Throughout the chassis, Elastic Stop Nuts are used wherever ordinary nuts loosen in service. Here they are fastening the hand-brake drum on the propeller shaft.

ON the road, trucks earn their keep. In the shop they eat their heads off.

The Railway Express Agency knows that well. And they learned one of the answers to keeping trucks on the go way back in 1927.

They use Elastic Stop Nuts — use them on a great many of their 15,000 trucks.

The reasons? These nuts increase safety and cut down mishaps. They reduce maintenance time and upkeep costs.

Elastic Stop Nuts go on like ordinary nuts. They need no auxiliary locking devices. They can be taken off and put back on time and time again and still lock. Nothing — even severe vibration — shakes them loose.

It's the elastic collar in the top that does the trick. It hugs the bolt threads tight. It cushions vibration. The nut can't shiver loose and turn.

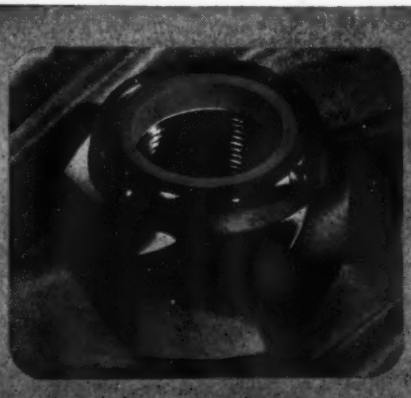
Today billions of these nuts with the ESNA red collar are being used on our aircraft. A bomber takes as many as 50,000 in a single ship.

In the days to come there will be countless fastening problems on all kinds of products. Perhaps you have one now.

If so, we'd like to talk about it. Our engineers are at your service ready to recommend the right Elastic Stop Nut to provide a safer, surer, trouble-free fastening.

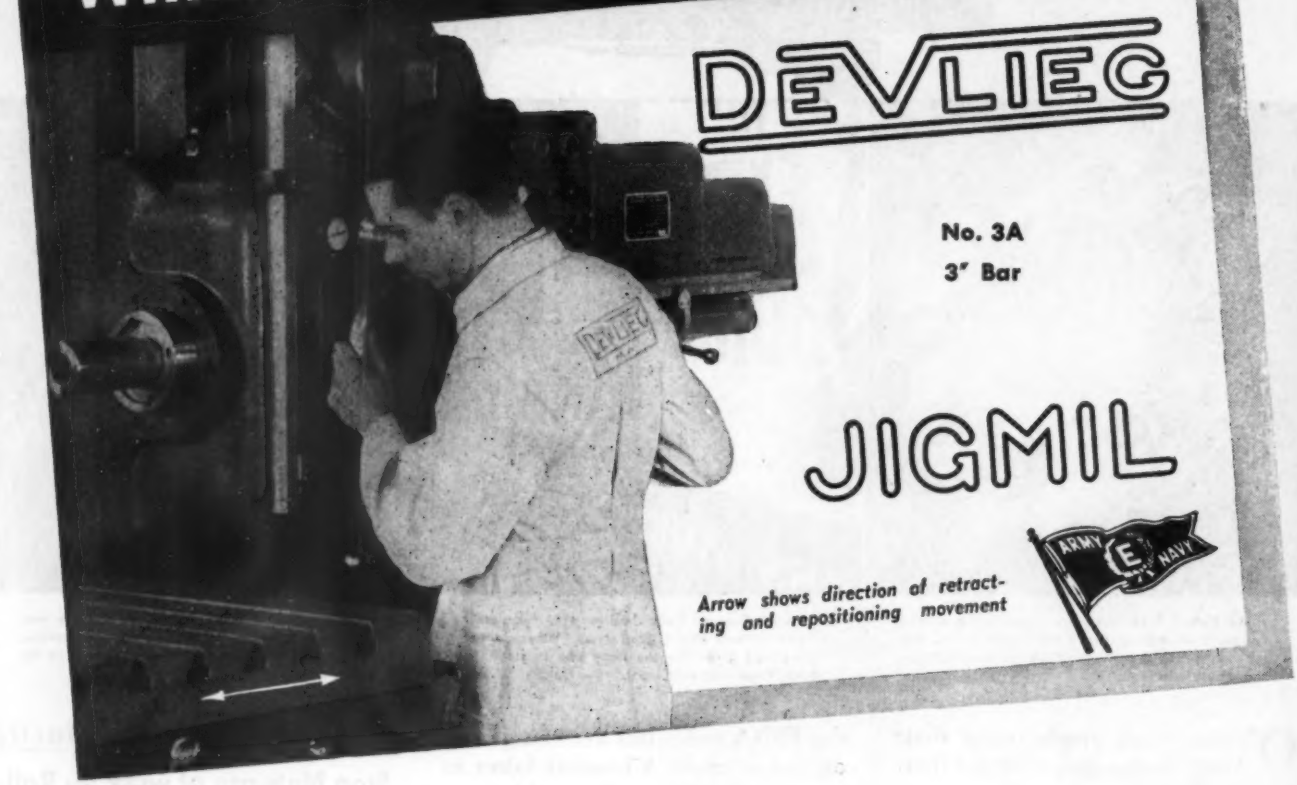
Major spots where Elastic Stop Nuts are at work on Railway Express Agency Trucks

Steering post — fasten bracket to cowl • Steering post — hold bracket to chassis • Drive shaft and universals • Master-brake cylinder to bracket • Hand-brake drum to shaft • Gas tank straps • Propeller shaft center carrier • Clutch and brake pedal brackets • Rear wheel hubs • Motor supports on cross member • Shackle bolt lock pin • Front bumper brackets • Cab bolts • Body hinges • Truck bodies — approximately 375 nuts.



ESNA
TRADE MARK OF
ELASTIC STOP NUT CORPORATION
OF AMERICA
ELASTIC STOP NUTS
Lock fast to make things last
UNION, NEW JERSEY AND
LINCOLN, NEBRASKA

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button



The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

DEVLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE 20, (DETROIT) MICHIGAN

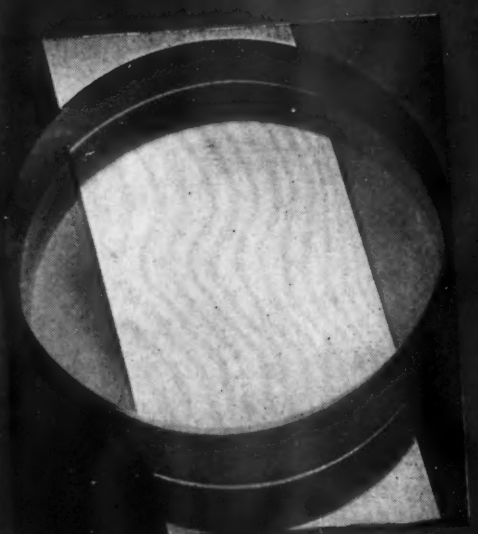
Write for Circular

DEVLIEG MACHINE TOOLS

Announcing

Van Keuren FUSED QUARTZ OPTICAL FLATS

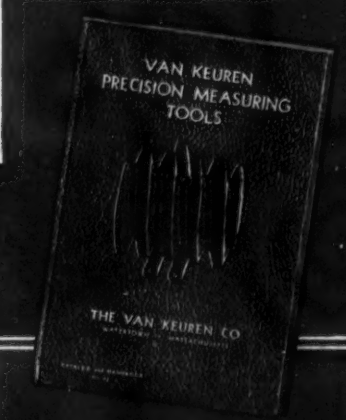
for checking costly gages . . . and precision lapped parts



In 1920, The Van Keuren Co. pioneered the use of optical flats for measurements with light waves. We now present double surface optical flats made of pure fused quartz.

Temperature changes affect quartz flats very little (1/16 as much as plate glass, 1/6 as much as pyrex). They will wear 10 times as long as ordinary flats. They are the most economical to purchase and the most accurate to use.

Use the new Van Keuren Fused Quartz Optical Flats for measuring the flatness of precision lapped parts, for amplifying gage and instrument maintenance and for the control of wear on gage blocks.



WRITE FOR YOUR COPY OF THE NEW VAN KEUREN CATALOG

Full information on Van Keuren precision measuring tools is given in our new Catalog and Handbook No. 32, just off the press.

This is a 144 page book, containing complete tables, data and formulae for measuring threads, gears, gages and precision parts.

Van Keuren

25th YEAR

CO., 176 WALTHAM ST., WATERTOWN, MASS.

HOW TWO HORIZONTAL BORING MACHINES CAN SAVE TIME ON LARGE WORK . . .

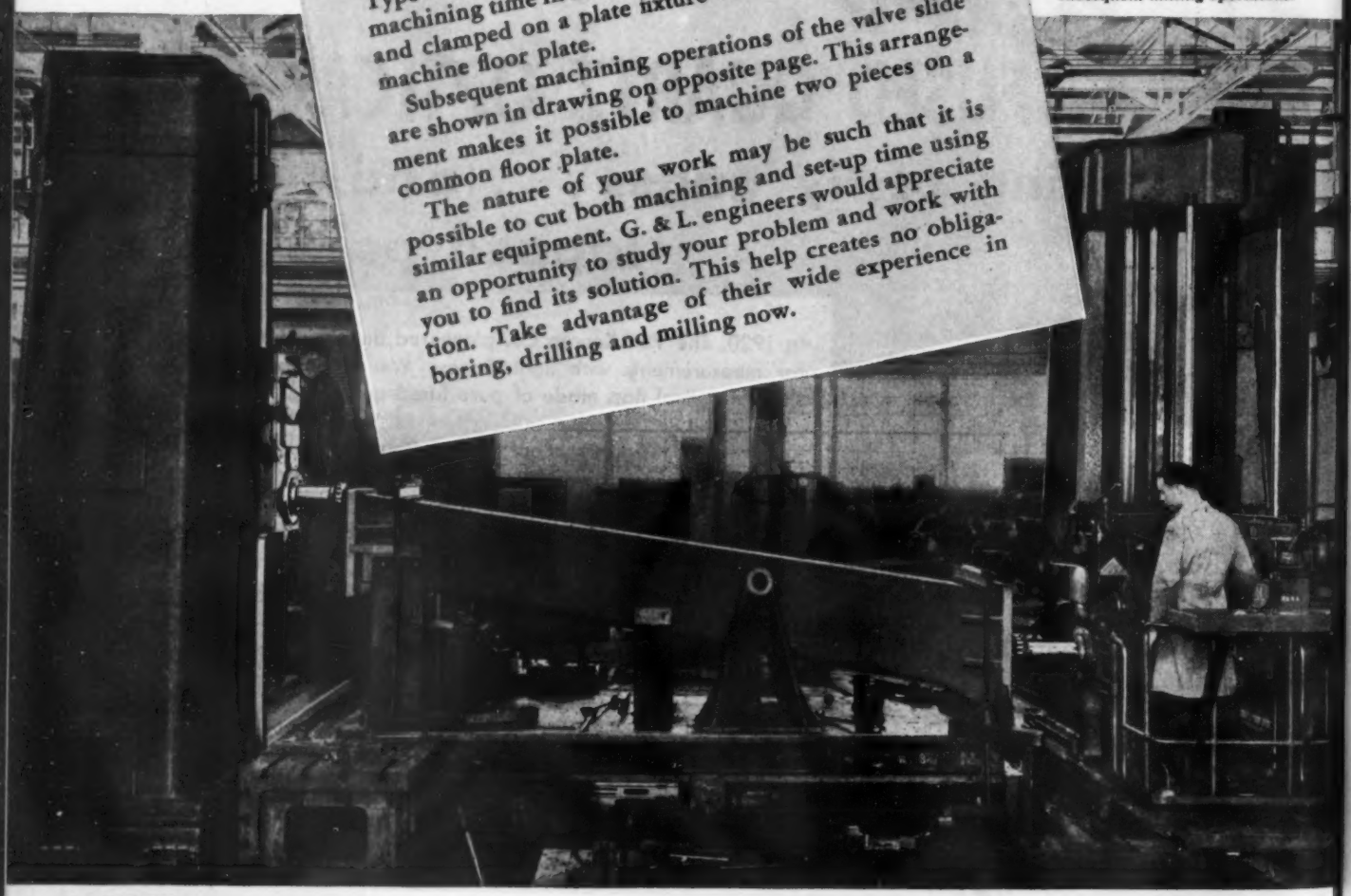
By Using G.&L. Floor-Type Machines Independently and as a Single Unit

Here is a three-ton 13′ 1″ column of a triple expansion engine being machined with two G. & L. Floor-Type Machines. Both ends are milled at once, cutting machining time in half. The engine column is blocked and clamped on a plate fixture which is bolted to the machine floor plate.

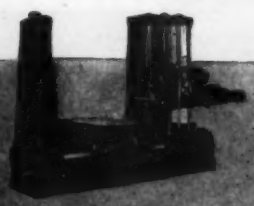
Subsequent machining operations of the valve slide are shown in drawing on opposite page. This arrangement makes it possible to machine two pieces on a common floor plate.

The nature of your work may be such that it is possible to cut both machining and set-up time using similar equipment. G. & L. engineers would appreciate an opportunity to study your problem and work with you to find its solution. This help creates no obligation. Take advantage of their wide experience in boring, drilling and milling now.

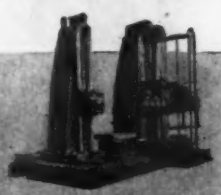
(Below) Triple expansion engine column set up to have ends milled at the same time. Column is mounted on a plate fixture which can be turned for subsequent milling operations.



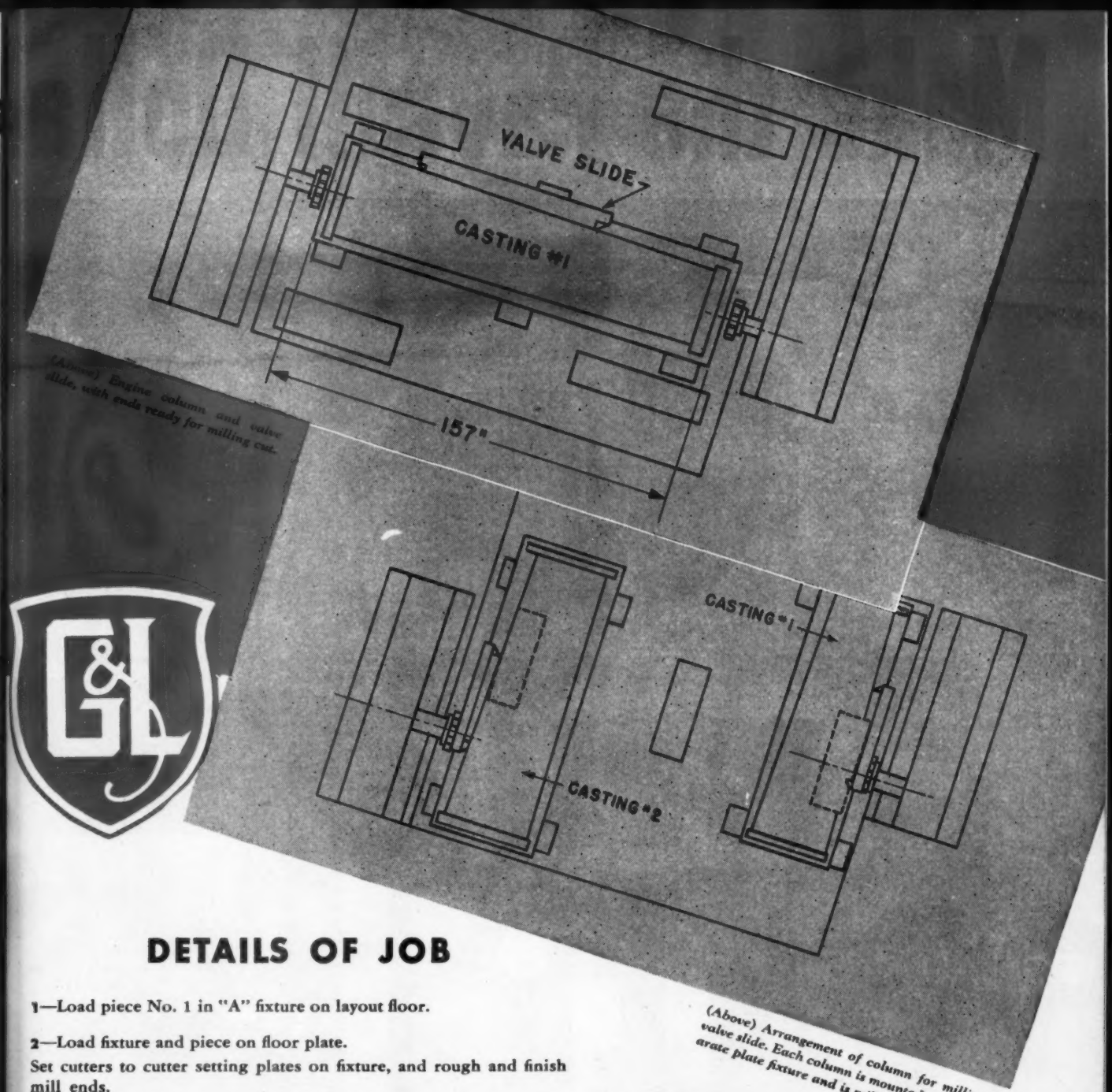
GIDDINGS & LEWIS
138 DOTY STREET



Right: G. & L. Table Type Machine.



Right: G. & L. Floor Type Machine.



(Above) Engine column and valve slide, with ends ready for milling cut.

(Above) Arrangement of column for milling valve slide. Each column is mounted on a separate plate fixture and is milled individually.

DETAILS OF JOB

1—Load piece No. 1 in "A" fixture on layout floor.

2—Load fixture and piece on floor plate.
Set cutters to cutter setting plates on fixture, and rough and finish mill ends.
Load second piece in "B" fixture on layout floor.

3—Reset No. 1 piece at 90° for milling surface for valve slides.
Set No. 2 piece in "B" fixture for milling surface for valve slides.
Mill valve slides on both pieces, using both machines, setting cutters to suitable cutter setting plates on fixture.

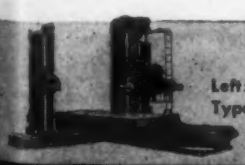
4—Remove "A" fixture to layout floor and unload.
Turn "B" fixture 90° and rough and finish mill both ends after setting cutters to cutter setting plates on fixture.
Load a third piece into "A" fixture while milling is going on.

5—Remove "B" fixture and replace with "A" fixture and repeat all operations until lot is completed.

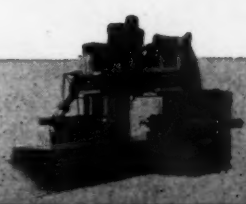
G&L MACHINE TOOL CO.
FOND DU LAC, WIS.

Additional Data

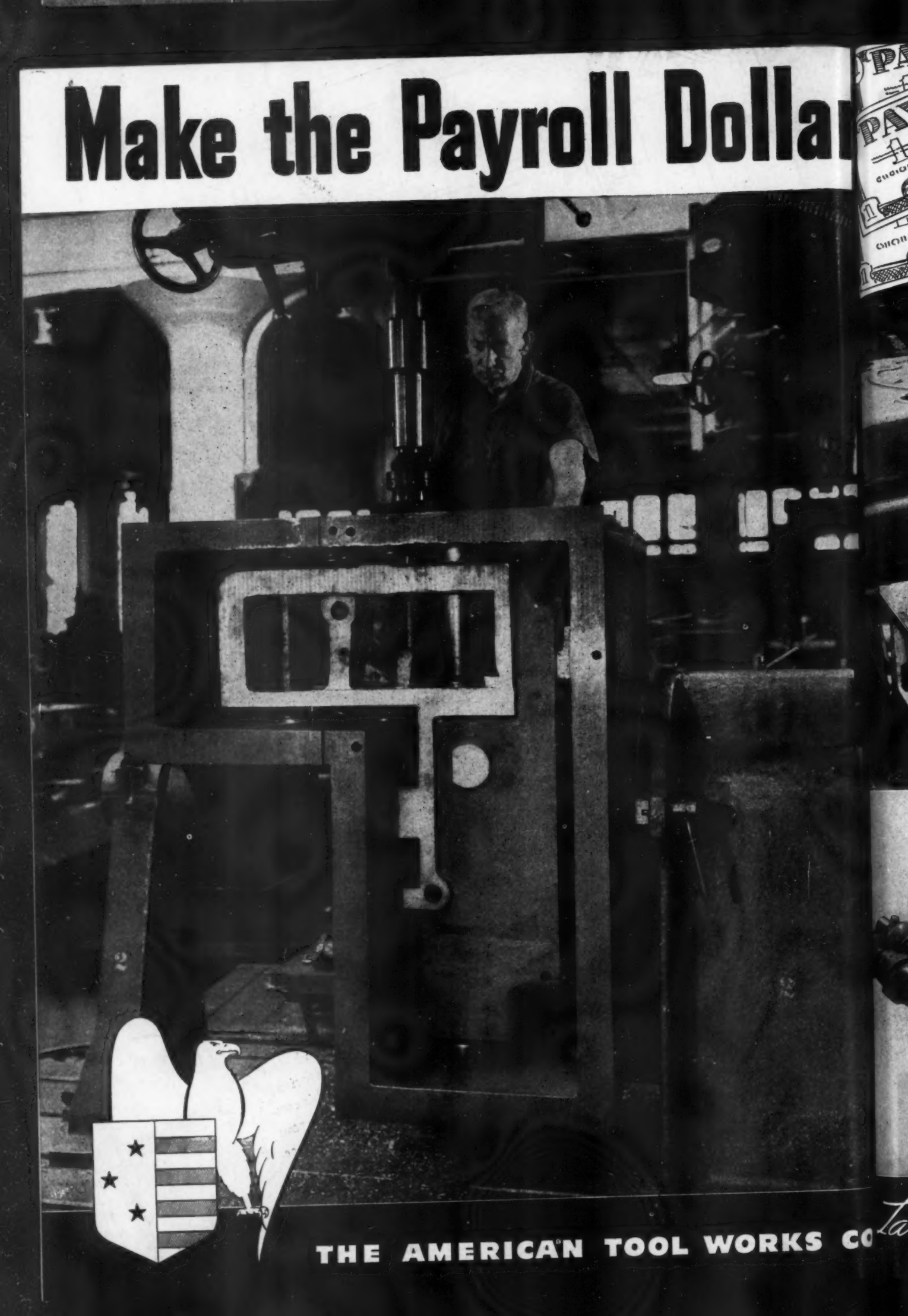
... covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin AM64.



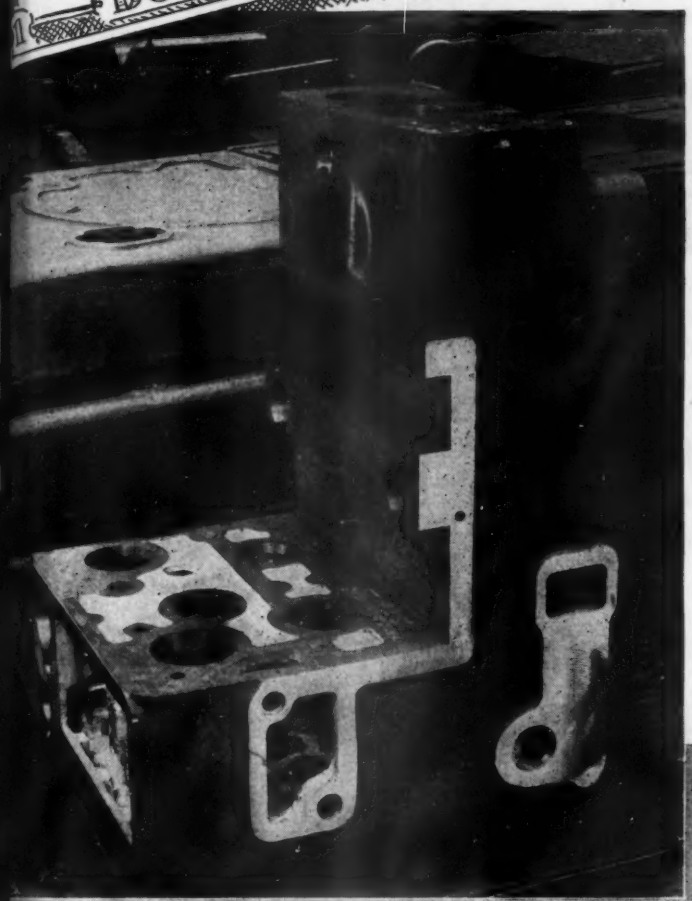
Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.


Make the Payroll Dollar
THE AMERICAN TOOL WORKS CO

Produce More



Use "American" Hole Wizard Radials and the new trunnion stand technique for boring, facing, drilling and tapping.

These illustrations show a head frame being machined on an "American" Hole Wizard Radial Drill through a revolving jig mounted on an indexing trunnion stand with outboard support and tools used for the various operations.

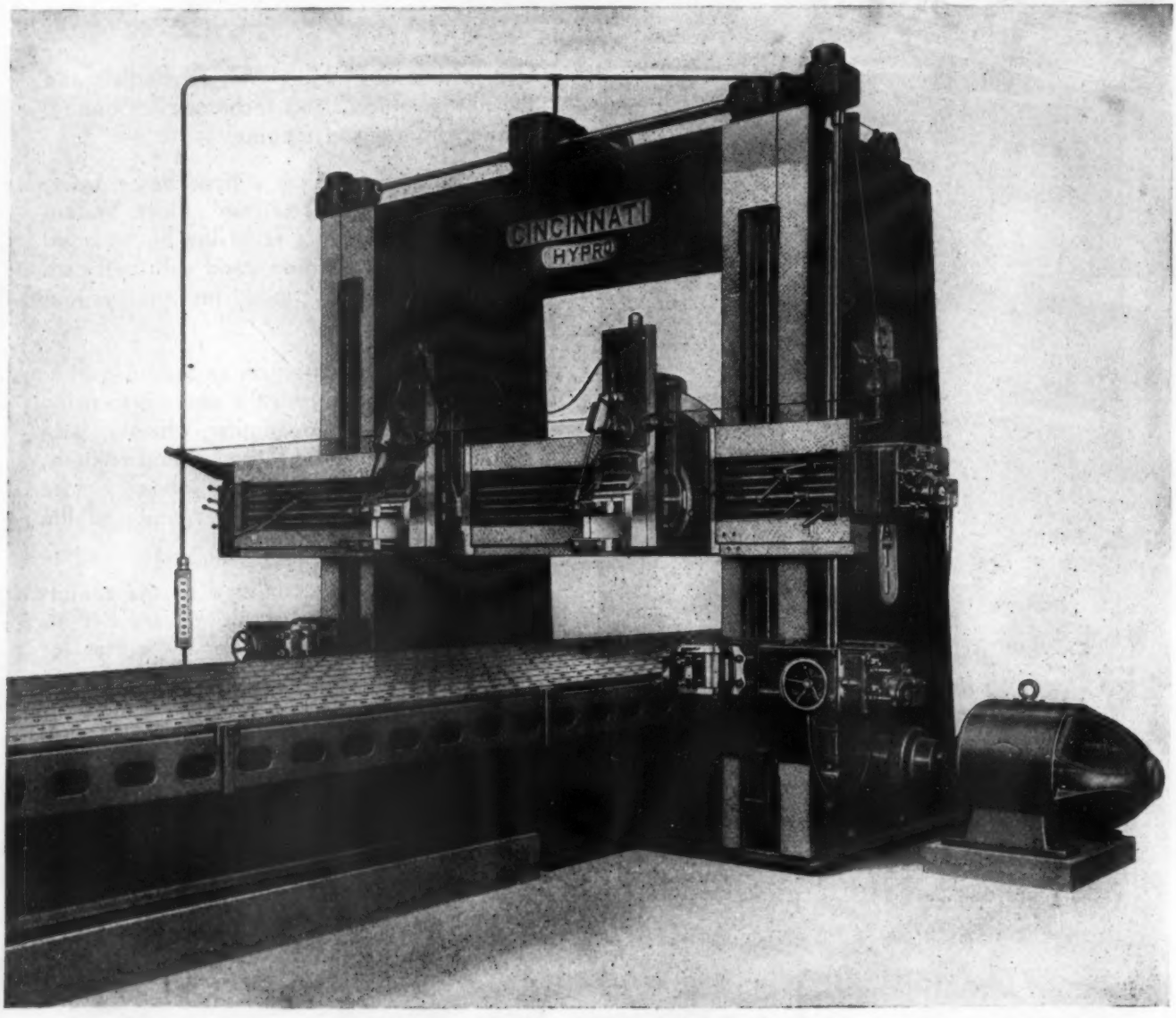
When a jig is mounted on an indexing trunnion stand, it is easy for the operator to swing it from one plane to another, whereas, base mounted jigs, must be shifted, rolled or lifted, resulting in the expenditure of infinitely more operator energy and harmful jarring of the work in the jig.

For further advantages offered by the combination of "American" Hole Wizard Radials and indexing trunnion stands, write for Bulletin No. 458.

Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

CINCINNATI *Hypro* PLANERS

Machine Ship Parts Quickly



THIS 120" x 96" x 44' Hypro is a most efficient shipyard tool. Pyramid type housings, a bed more than double the table's length, and side heads that have proven they can do 20% heavier work than those of other design, cause shipbuilders to specify Cincinnati Planers. Fine adjustment handles for positioning the rail heads and saddle control permitting operation at either end of the rail or at either saddle, makes these planers more convenient. Speed—Power—Convenient Controls—are built into Cincinnati Hypro Double Housing Planers. Write for Bulletin 136-AM describing them.

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

PRECISION RACKS CUT WITH THESE BARBER-COLMAN MULTIPLE RACK CUTTERS

A good example of simple production tooling as against tool room methods. They used to cut these racks one tooth at a time with a single row formed cutter, believing that this was necessary in order to obtain required accuracy. So it really was no great miracle to show a production increase of 8000% with B-C Multiple Cutters, over former production of four racks per day. On the other hand, it called for a good, well-made gang cutter to hold the accuracy — not over .001" error allowed between any two points on the pitch line. So, for *accuracy AND production,* use Barber-Colman Milling Cutters.

MACHINE SET-UP *and* PRODUCTION DATA

Material — 17 ST Aluminum.

Tolerance — .001" between any two points on pitch line.

Cutter — B-C 8-section Multiple-Tooth Rack Cutter, 24 pitch, each section 3" dia. 2" wide, 1½" hole, on 24" arbor.

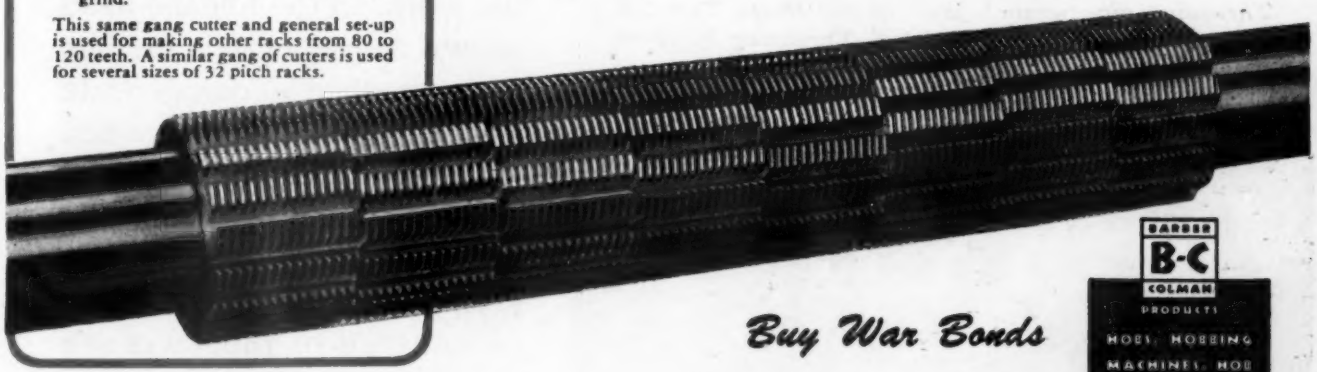
Machine — No. 3 Cincinnati Miller, Dial Type.

Set-up — Feed 1⅜" per min., cutter speed 150 r.p.m.

Time — 20 min. per load of 13, floor to floor.

Cutter Life — 1000 to 1500 pieces per grind.

This same gang cutter and general set-up is used for making other racks from 80 to 120 teeth. A similar gang of cutters is used for several sizes of 32 pitch racks.



Buy War Bonds

BARBER B-C COLMAN PRODUCTS

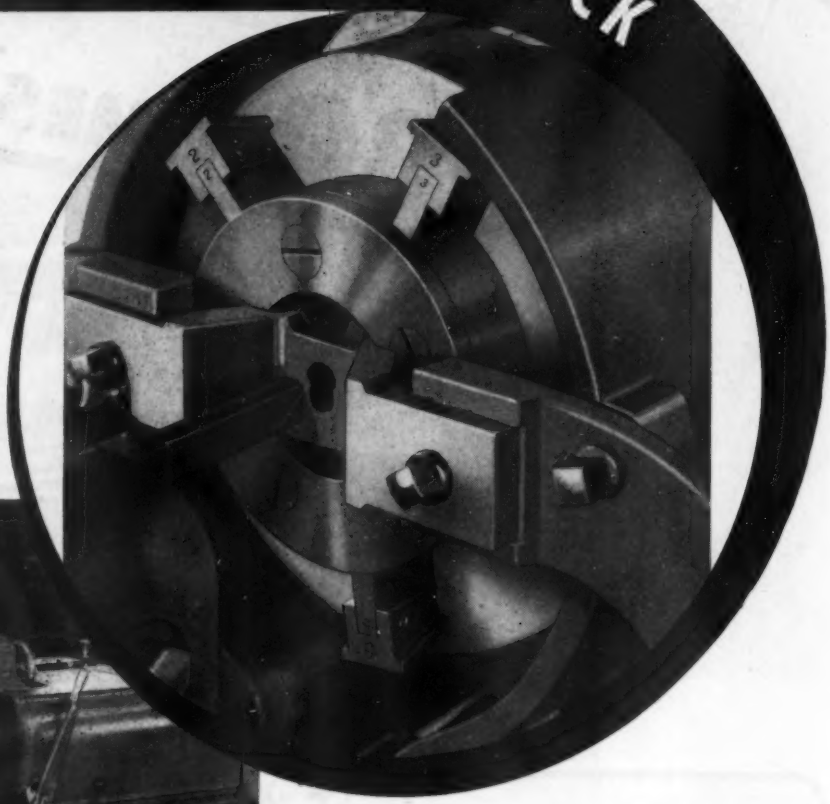
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

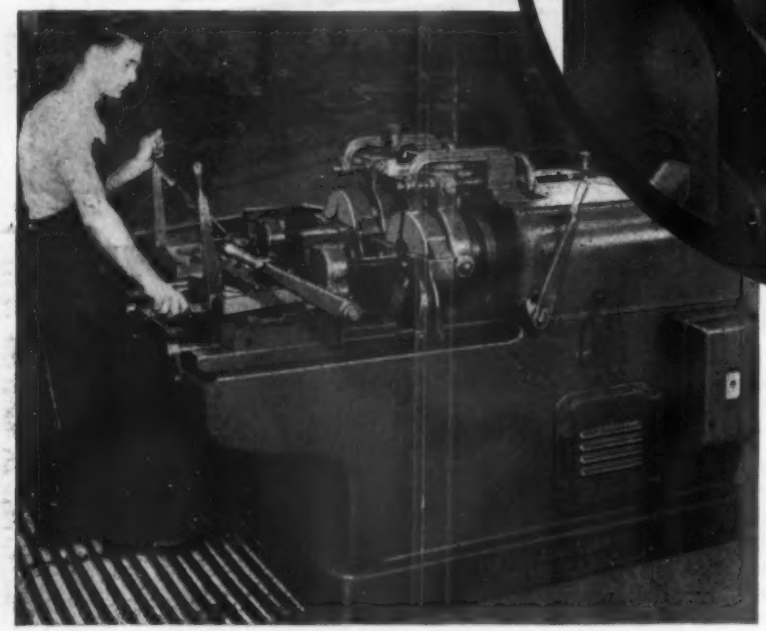
Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

FOR THREADING FLAT BAR STOCK

The Acme Hob Type 5 DIE HEAD eliminates torque and speeds production

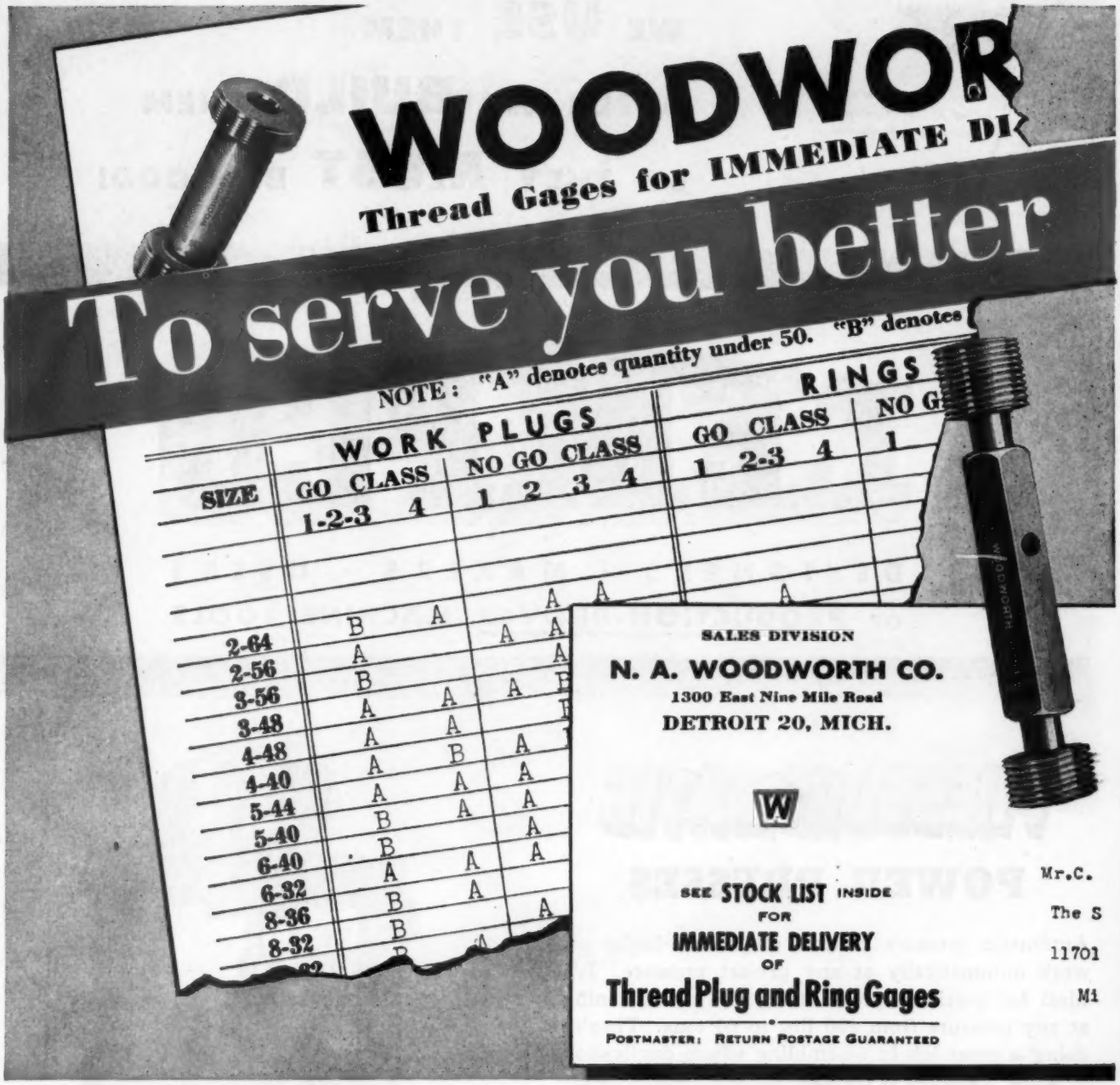




Threading pipe wrench jaws at the Ridge Tool Co. with a 2" double spindle ACME Threading Machine and an ACME hob type 5 die head.

The problem of threading flat bar stock with an interrupted cut, is solved by the ACME hob type 5 die head. This special head insures three chasers always being in contact with the work. In the five die head shown above, a guide bar has been attached to compensate for the torque developed when threading long bar stock. This adaptation of ACME Threading Equipment to difficult jobs, illustrates why the large percentage of pipe wrench manufacturers are using ACME Threading Machines today. Bulletin 843 gives complete details.

ACME MACHINERY DIVISION
of THE HILL ACME COMPANY
Established 1882
FORGING · THREADING · TAPPING · BOLT · NUT · RIVET MACHINES
4535 ST. CLAIR AVENUE
CLEVELAND, OHIO



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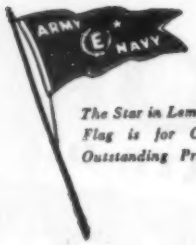


The Star in Lempco's "E" Flag is for Continued Outstanding Production.

WE USE THEM
AFTER WE BUILD THEM
SO THEY MUST BE GOOD!

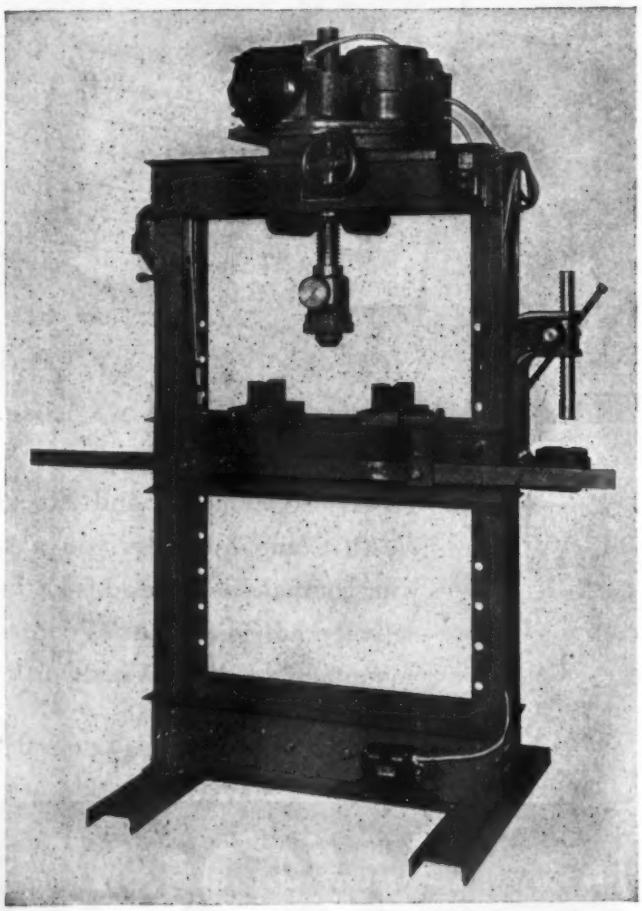
LEMPCO

DESIGNERS • MAKERS • USERS
OF PRODUCTION-PROVED MACHINE TOOLS

PRESSUREMATIC
POWER PRESSES

Automatic pressure control stops and backs off work automatically at any pre-set pressure. It's ideal for precision press fitting and straightening at any pressure from 200 lbs. to 60 tons. They're doing a great job in assembling where duplication of work pressures is critical; on die try-outs; press fitting tank parts; and doing a tremendous variety of other war work. Foot pedal controls, adjustable bolster, movable ram heads. Choice of pressures, ram travels, and ram speeds available to meet your specific needs. Fast-acting — developing up to 60 tons pressure within 4 seconds.

★ ***EXCLUSIVE AUTOMATIC PRESSURE CONTROL***
★ ***20, 40, AND 60 TON CAPACITIES***
★ ***ELECTRIC & HYDRAULIC MODELS***



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CEILING PRICED!
WRITE FOR DETAILED SPECIFICATIONS

who dares to talk to them about a THIRD WORLD WAR?

They were at Tarawa.
Many of them now wear empty sleeves, or bandages where their eyes were. And a thousand and twenty-six will rise up never from the sands of Tarawa Island.

They couldn't hear it. In the roar of that tornado, as they fought and fell, so far from the hills of home, they couldn't hear the words: "*. . . history repeats . . . and what will we get out of it but . . . how the hell can we police . . . the next one will be against . . . already sowing the seeds for . . . and twenty years from now, brother . . . the Third World War . . .*"
In elevators, on the street, in plush chairs that let you down easy, in columns and editorials and from the political stump.

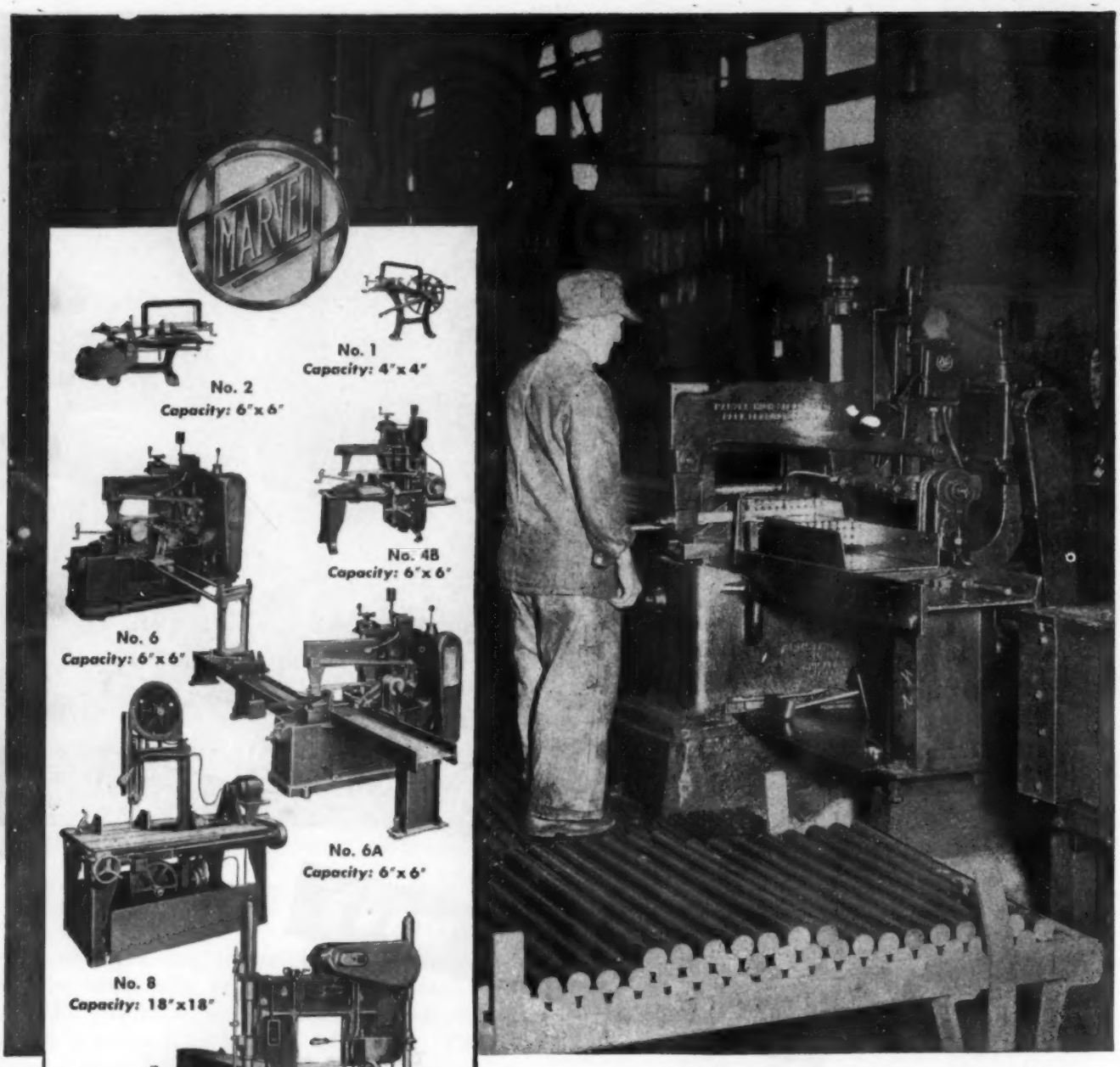
What is the matter with us? Can't we at home at least go into peace with some spark of their courage and determination that this war is not another mockery, not just another World War? Let no man give voice to that weak and deadly cynicism. Let him stand up and think straight and have the courage to call the lie to any man in public or private life who fails to do the same.

And let each of us do everything humanly possible to help win this war sooner . . . buy War Bonds—give blood—boycott the black market . . . and plan ahead now for a *better* America than we had before.

Today, the engineers of the machine tool industry can greatly help the post-war planners of government and business management. One of these is a Bryant man . . . We invite you to send for him.

BRYANT

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD, VERMONT, U. S. A.



This MARVEL 9A Production Saw paid its cost in 30 days

There's none of the old fashioned, tedious, plugging-along type of hack sawing at the Shop of the I. C. Railway because they do their cutting-off with a high speed MARVEL No. 9A Production Saw—the same MARVEL Saw used to cut-off astronomical numbers of rifle and machine gun barrels.

Built for continuous heavy-duty operation, this really fast, all-ball-bearing saw automatically feeds, measures and cuts-off single or nested bars with no more operator attention than an automatic screw machine. On the job illustrated above, six hours after forty 18' x 1" steel bars were laid on the saw's feed rack, they had been cut into 840 accurate, 10-inch lengths, for staybolts. Equally efficient on both production runs and miscellaneous cuts, this saw "paid for itself in the first thirty days of operation".

Write for new Catalog

ARMSTRONG - BLUM MFG. CO.

5700 Bloomingdale Avenue — Chicago 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

NOW INFINITE-STEP SPEED CONTROL WITH A SINGLE DIAL

Tinius-Olsen 60,000 inch-pound torsion testing machine. Thy-mo-trol drive gives it testing speeds of 5 to 180 deg per min—a ratio of 36 to 1. Conveniently located control stations enable the operator to start or stop the motor, or to vary its speed from 160 to 2300 rpm. Note that everything else required to control the motor is contained in a single panel (here shown with cover removed), which illustrates how easily Thy-mo-trol drive can be applied on machines.

Made Possible by THY-MO-TROL DRIVE

BY means of Thy-mo-trol drive, machine operators can select exactly the right speed for each job, and often they can do a wider variety of work because of the extremely wide speed range that is possible. Speed adjustment—in an infinite number of steps—is provided by a single potentiometer. It is so arranged that it adjusts armature and field voltages correctly to obtain motor-speed ranges as wide as 100 to 1—or greater if required.

What Thy-mo-trol Drive Is

Thy-mo-trol drive consists of an electronic panel, d-c motor, power transformer, and control station. It takes a-c power from your supply line and, through its d-c motor, delivers torque to your load. The electronic panel starts, accelerates, controls the speed, provides dynamic braking for stopping, and reverses the motor. *Standard* drives can be obtained from 1/8 to 20 hp.

Five OTHER Advantages

1. Operates from a-c power
2. Constant speed under changing load
3. Smooth, fast constant-current acceleration
4. Low maintenance
5. Speed can be preset before starting

How to Buy Thy-mo-trol

Just give our nearest G-E office complete information about your requirements—nature of the load, speed range, horsepower, etc. Our engineers will select the right Thy-mo-trol drive to give you exactly the operating characteristics you want. *General Electric Company, Schenectady 5, N. Y.*

DO YOU HAVE THIS BULLETIN?

General Electric, Section A668-15
Schenectady 5, N. Y.

Please send me a copy of Bulletin GEA-4025, "Adjustable Speed Electronically with Thy-mo-trol Drive," which tells what Thy-mo-trol will do, and how it works.

Name.....

Company.....

Address.....

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5980

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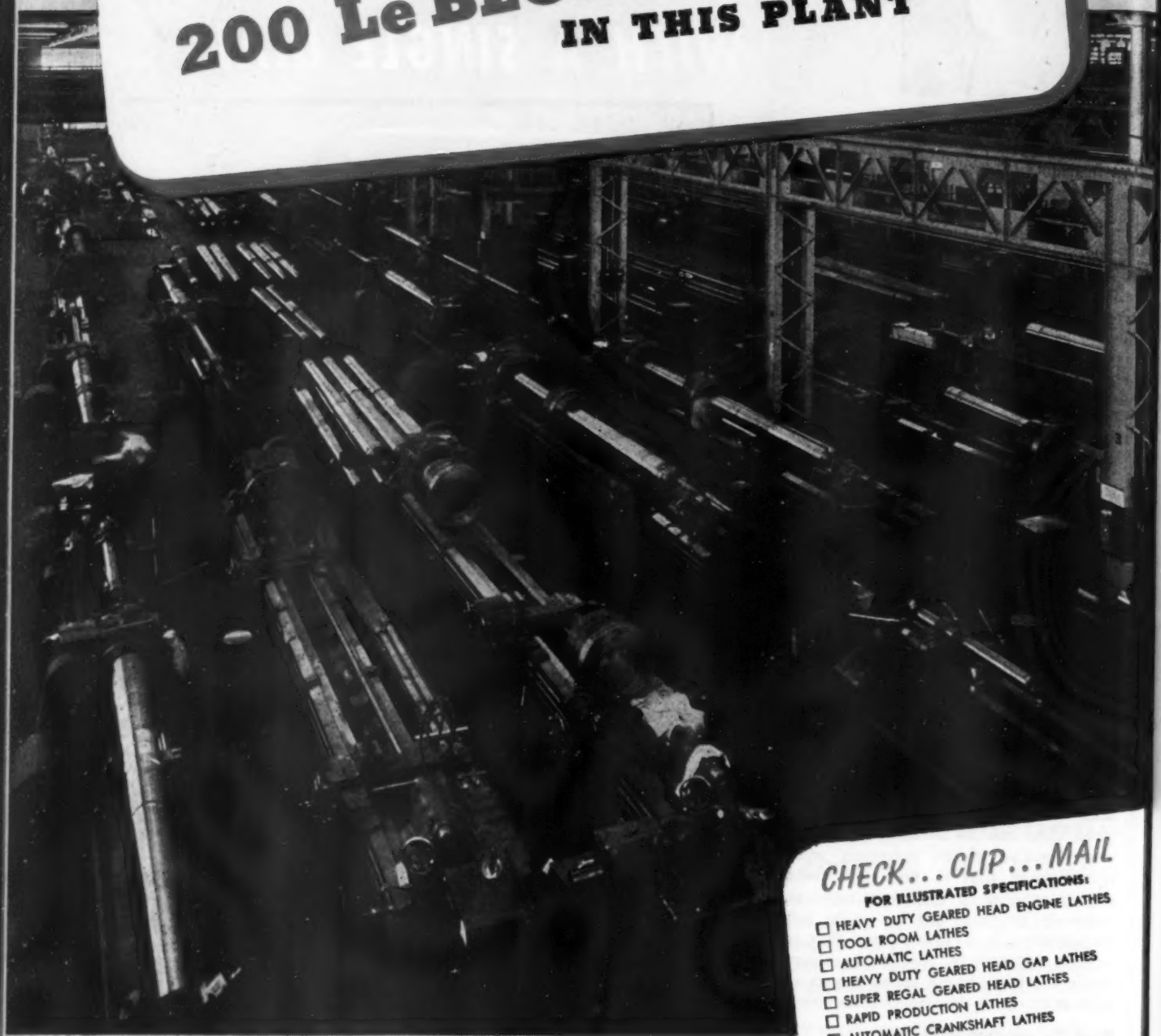
THERE ARE 200 Le BLOND LATHES IN THIS PLANT



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FOR ILLUSTRATED SPECIFICATIONS:

- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
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A New TOOL ROOM GRINDING WHEEL by MID-WEST

--- The MID-WEST Super-Cut

AN ideal tool room wheel, engineered specifically for unusually fast stock removal and extremely fine finishing of hard, high speed tool steels.

An open structure wheel, the MID-WEST SUPER-CUT is made with an exclusive MID-WEST developed abrasive that assures an even spread of grain, prevents "hard spots" and guarantees an absolutely uniform grade.

MID-WEST SUPER-CUT wheels are manufactured in two distinct types—red and white—and with a range of grain and grade sufficient to handle any high speed steel tool operation.

For hardened or unhardened alloy or high speed steels specify MID-WEST SUPER-CUT wheels. You will find they

CUT FASTER* CUT COOLER* LAST LONGER* LEAVE FINER FINISHES*

* *These claims are based on many months of actual operation in high production plants throughout the United States. Ask our engineers to furnish you with specific examples of MID-WEST SUPER-CUT wheel performances. Or mail the coupon printed herewith.*

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. — **1960 E. Milwaukee Avenue, Detroit 11, Mich.** — **Rochester, Pa.**

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
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Gentlemen:

Please send me additional details about MID-WEST SUPER-CUT high speed steel grinding wheels.

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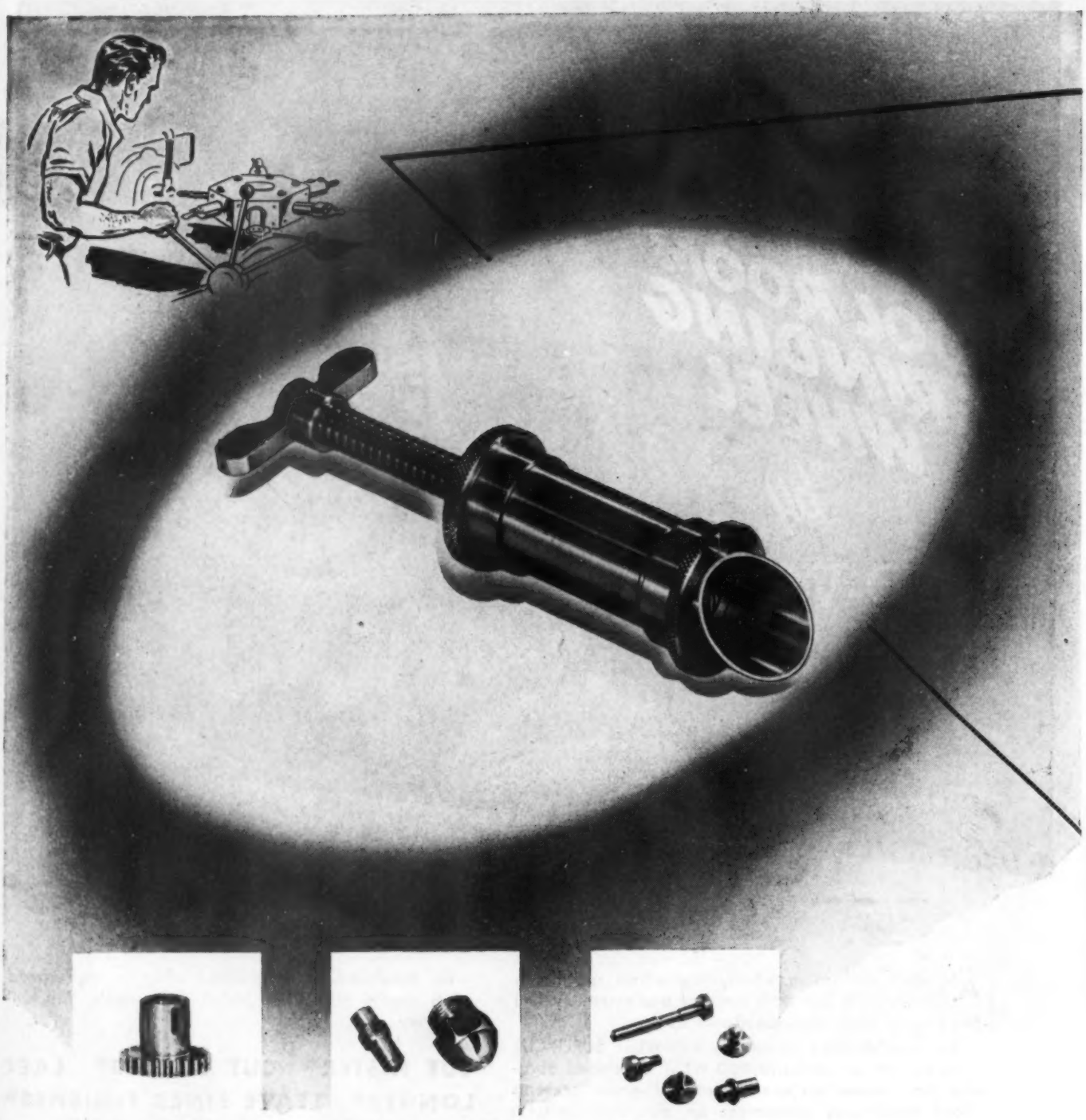


Absolute Uniformity for Precision Parts

The close tolerance and high finish requirements for precision instrument parts like this were more easily obtained when the manufacturer went to Carpenter Free-Machining Stainless #5.

Rejects Cut on These Close Tolerance Parts

A switch to uniform Carpenter Free-Machining Stainless #5 practically eliminated rejects in machining these oil burner nozzle parts. Tool life was also noticeably increased.

Turned Out on Automatics

Testimony of the easy-machining qualities of Carpenter Stainless #5 and #8 is the fact that tiny screws and many intricate parts can be accurately and economically produced on automatics.

THE CARPENTER STEEL COMPANY · 109 W. BERN STREET · READING, PA.

How Easily and Economically Could You Machine These Stainless Parts?

When you have a stainless job for an automatic screw machine—or a forging that requires machining—investigate the possibilities of using a Free-Machining grade. Carpenter Free-Machining Stainless offers you the opportunity to machine stainless parts, at speeds approaching that used for ordinary screw stock, and often with standard tooling set-ups.

Many of you may remember back in the early days when machining stainless was almost prohibitive from a cost standpoint. Tools broke, rejects were high, speeds were slow. When Carpenter invented the Free-Machining types this picture changed almost overnight. Tool breakage practically ceased, rejects were cut to a minimum, cutting speeds were greatly increased, and the reduced costs broadened the use of stainless for many applications.

Today, thousands of wartime products are being produced faster, to closer tolerances, at lower costs with Carpenter Free-Machining Stainless. Tomorrow the benefits of corrosion resistance, strength / weight ratio, high physicals and longer life can be given to your products with Free-Machining Stainless.

Check your machining operations and see if a Free-Machining Stainless grade wouldn't save you time and money, help avoid shop troubles. Your Carpenter representative has helped hundreds of other stainless users solve tough machining problems with Free-Machining Stainless. He can help you select the best Free-Machining grade for the job. Call him in now.

5 Advantages You Get from Carpenter Free-Machining Stainless

Longer Tool Life

Less Tool Breakage

Faster Machining Speeds

Minimum Rejects

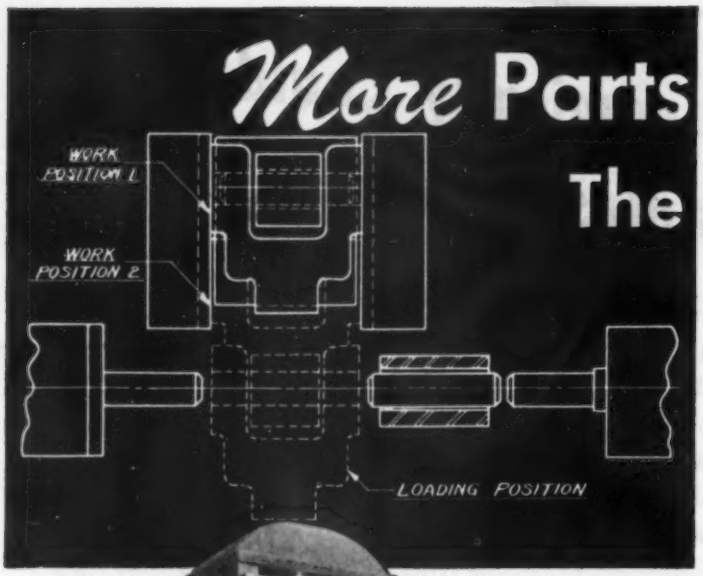
Lower Unit Costs

Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

More Parts Per Broach The *American* Way—

PROVEN in war... Ready for PEACE

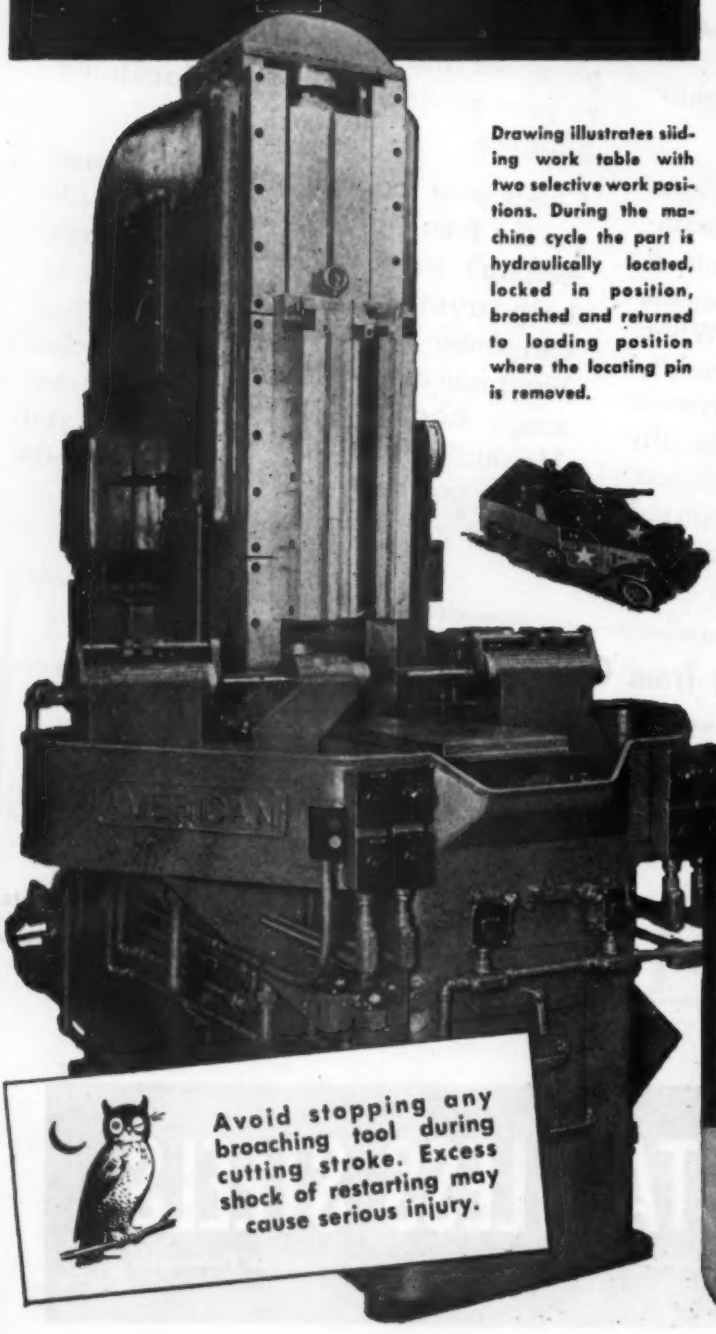


Drawing illustrates sliding work table with two selective work positions. During the machine cycle the part is hydraulically located, locked in position, broached and returned to loading position where the locating pin is removed.

Precision work at a mass production rate—*plus* the extra economy of doubled output per broach sharpening!

This is a typical example of the application of *American's* complete broaching service to a production problem. American Broach & Machine Company engineers set up this operation to finish the sides of universal joint yokes.

An American SB-42-10 surface broaching machine is used, equipped with a special receding table incorporating two selective work positions. Extra wide broaches, more than twice the part width, make possible the use of one half of the broaching surface at a time. When this half becomes dull the position may be changed so that the remaining half continues the operation. Twice the number of parts per broach sharpening are obtained, reducing production cost and time, maintaining exceptional finish and accuracy!



Avoid stopping any broaching tool during cutting stroke. Excess shock of restarting may cause serious injury.

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF

Machining Magnesium?

Here's how to assure maximum production

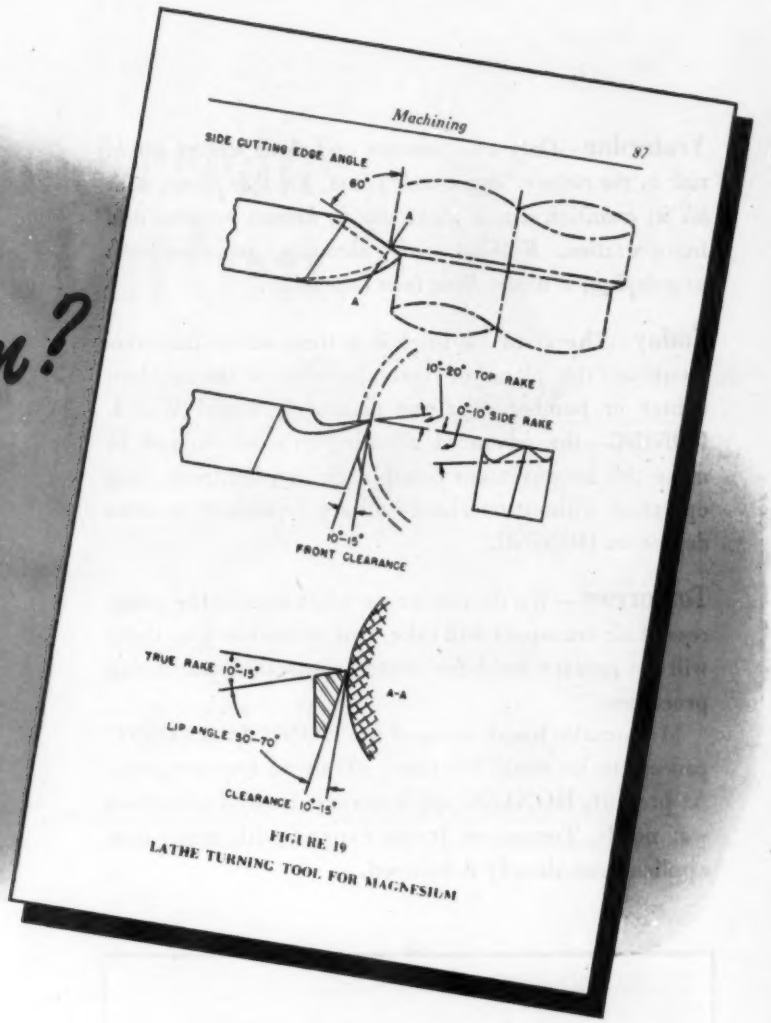


FIGURE 19
LATHE TURNING TOOL FOR MAGNESIUM

Magnesium alloys have excellent machinability. They can be cut at high speeds and feeds, taking a fine finish, while maintaining close tolerances. Tools used with other metals usually perform satisfactorily on magnesium, but best results can be obtained if these rules are followed:

1. Cutting edges must be kept sharp. Tool faces should be polished to insure free cutting action and reduce the tendency for magnesium particles to adhere to the tool tip. Clearances for chips should be large.

2. Magnesium is generally machined dry. In special cases, however, a cutting fluid is used. Do not use oil-water emulsions.

3. Taps and reamers should be slightly oversize, compared to such tools for other metals; magnesium cuts close to size.

4. Because of a lower modulus of elasticity, magnesium parts must be firmly but carefully clamped, to insure accuracy and prevent deformation.

These are just the high spots of "Do's and Don'ts" learned in our more than twenty years of producing magnesium products. For Mazlo Magnesium literature on this subject, write Aluminum Company of America, Sales Agent for Mazlo Magnesium Products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

Yesterday—*Only true pioneers and thrill seekers would ride in the rickety "egg crate" plane. Yet that plane, with all its crudities, was a giant step in human progress and transportation. Without early abrading, processes such as grinding, it would have been impossible.*

Today—The giant air liner is a tremendous improvement on the plane of yesterday—as is the modern fighter or bomber over the planes of World War I. HONING—the advanced abrading process—helped to make this improvement possible. Safety, lightness, long operation without overhaul—all are dependent to some degree on HONING.

Tomorrow—We do not know what course the progress of air transport will take. But whatever it is, there will be greater need for better controlled machining processes.

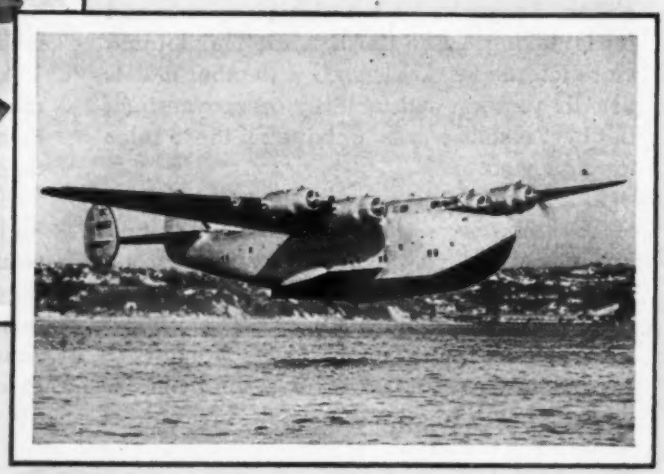
Micromatic has developed the HONE ABRADING process to be ready for these advanced requirements. At present, HONING application is limited to serious war needs. Tomorrow, it can expand with many new applications already developed.

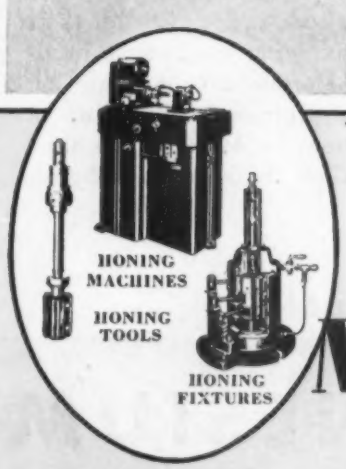
HONING

helped to develop yesterday's "EGG CRATE" Plane into the

SAFE, MODERN AIR TRANSPORT

MICRO MATIC





Micromatic HONE CORPORATION

Detroit, Michigan

MAKERS OF HONING MACHINE TOOLS

HONING helped create "400" Aviation

The tactical need for outflying our enemy has crowded military aviation into the "400" bracket, as may be seen in the comparison below:

	WORLD WAR I	WORLD WAR II
Speed	130 MPH	400 MPH
Period Between Engine Overhauls	40 Hours	400 Hours
Tactical Ceiling	12,000 Feet	40,000 Feet
Engine HP	125 HP (Liberty)	2,000 HP

This amazing advancement has been accomplished largely by better engineering design, better metallurgy and better controlled machining. Microhoning provides one of the most important machining controls by assuring maximum quality and safety in the bearing surfaces of our military and naval plane engines and other plane mechanisms.

Bearing bores and other critical surfaces are finished by Microhoning—the modern abrading process which removes stock at rates up to 65 cubic inches per hour, generates accuracy for roundness and straightness of bore within .0002" to .0003" and any desired surface finish.

Better planes for war mean better planes for the peace to come.

Some Microhoned Aircraft Bores

Engine Cylinder Barrels

Master Con Rod (all bores)

Articulated Rod (all bores)

Piston Pin Bores

Valve Guide Bores

Pinion Gear Bores

Oleo Cylinder Bores

Brake Cylinder Bores

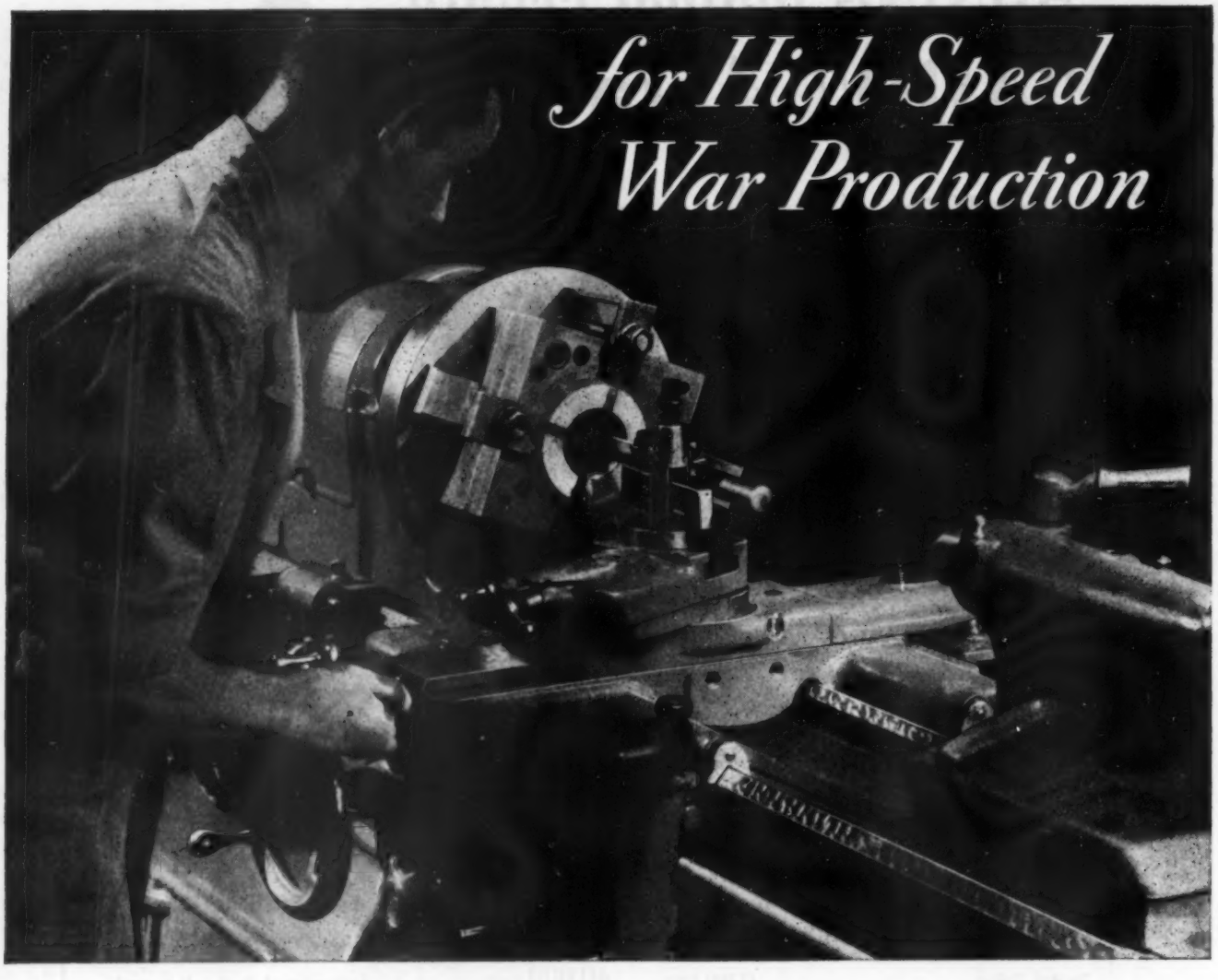
Gun Turret Hydraulic Cylinder Bores and many other parts

MICRO MATIC

MICROMATIC HONE CORPORATION

DETROIT, MICHIGAN

HIGH PRECISION



for High-Speed War Production

High precision is the key to high speed war production—for mass production is based on a degree of accuracy that assures the perfect interchangeability of parts and units.

In hundreds of war production plants, South Bend Lathes are preferred because their high precision makes it easier to maintain exacting tolerances on important toolroom and production operations.

Modern in design, built to the highest standards of workmanship, South Bend Lathes are capable of performing finish turning and boring operations with such accuracy that subsequent grinding, honing, or lapping operations can often be eliminated. A wide range of spindle speeds permits taking full advantage of carbide or diamond tipped tools.

Convenient controls make for an ease of operation which reduces fatigue and lessens the possibility of error. Requiring a minimum of effort to run, South Bend Lathes are especially desirable where women lathe operators are employed. Write for your copy of Catalog 100C which describes South Bend Engine Lathes, Toolroom Lathes and Turret Lathes.

Buy War Bonds!

"HOW TO RUN A LATHE"

A practical operator's handbook for apprentice training that covers the fundamentals of lathe operation. It contains 128 pages, 5½" x 8", and over 365 illustrations. Price 25c per copy. Sample copies free to shop superintendents and apprentice supervisors.

ARMY E NAVY

SOUTH BEND LATHE WORKS

SOUTH BEND 22, INDIANA • LATHE BUILDERS FOR 37 YEARS

FROM METAL CLEANING TO ASSEMBLY
Sooner
The Bullard-Dunn Station Type Conveyor
● Lifts heavy weights to convenient heights (3000 lbs. up to 40 inches for the smaller size; 9000 lbs. up to 66 inches for the larger size).
● Is built by Bullard, to Bullard's machine tool standards.

WITH THIS BULLARD-DUNN AUTOMATIC STATION TYPE CONVEYOR

This machine is conveying heat treated tractor parts through the Bullard-Dunn Descaling Process, but it is equally valuable for other sequences too;—for example, plating, blackening, pickling, bonderizing, cleaning aluminum prior to welding, and heat treating.

This machine expedites production like other conveyors, but as a machine it is different. It is built like a machine tool by a machine tool company. It is rugged and can carry heavy, unbalanced loads through high lifts. The Genevo type of index motion produces smooth indexing. The machine is compact, the oil for the hydraulic operation being within the column itself, and the pump and motors being mounted on the column. The simplicity of the machine and few parts involved make for uninterrupted service.

Write for the booklet giving specifications and other information.

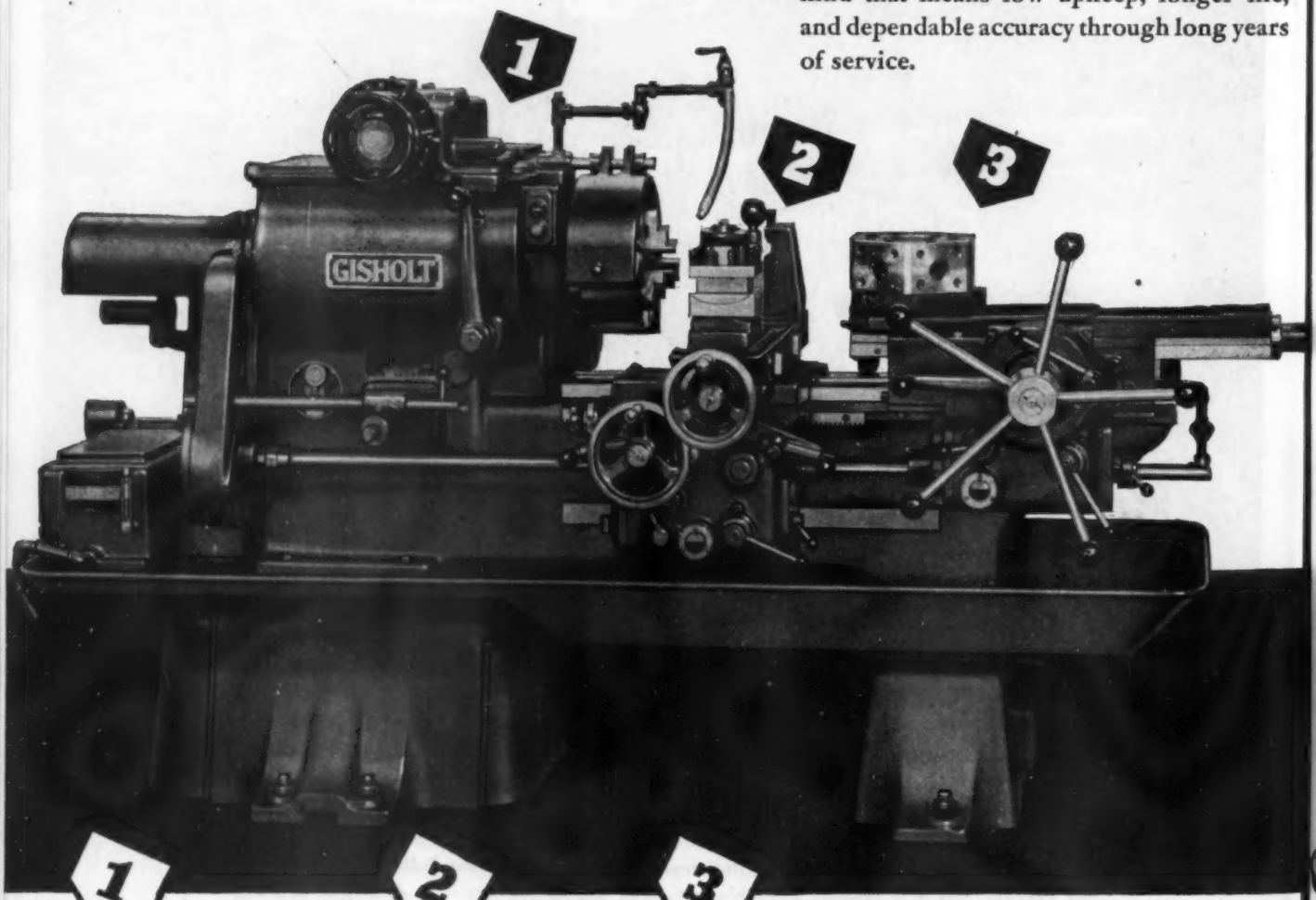
BULLARD-DUNN DIVISION OF THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

BULLARD-DUNN Conveyor

Strength . . .

WHERE IT'S NEEDED MOST!

STRENGTH—*tremendous strength*—enables these Gisholt Ram Type Turret Lathes to take all the punishment you'll ever give them. No detail has been overlooked to assure the sturdiness for extra capacity—for heavy, multiple cuts up to the limit of tools without danger of breakage. This is strength of the enduring kind that means low upkeep, longer life, and dependable accuracy through long years of service.



1 Rigid, one-piece bed and headstock are cast integrally and stiffened with cross ribs, permitting the heaviest cutting loads without vibration. Heat-treated alloy gears are carried on taper and ball bearings throughout. Power is transmitted through a sturdy multiple disc clutch.

2 Bed ways, turret ways, gibs and clamps are hardened steel. Binder lever locks square turret in place, in effect as one piece with cross slide. Extended carriage wings prevent tilting. Broad cross slide provides rigid support for cutting tools.

3 Double beveled clamp ring binds turret rigidly to slide, relieves locating pin and bushings of all strain in taking heavy cuts. There is no chance for the turret to weave and lose accuracy. Protected gib lock keeps turret slide in exact alignment. Turret head is extra heavy with large protected bearing directly on ram.

GISHOLT MACHINE COMPANY • *1201 E. Washington Ave., Madison 3, Wis.*

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

METRO

PRECISION GAGES and CARBIDE TIPPED TOOLS

Sound engineering design and skilled craftsmanship give Metro Gages and Carbide Tipped Tools the dependable precision that assures uniform accuracy at all times. Speeds up production on the most exacting machine operations.

Metro Standard Gages and Carbide Tipped Tools are available for immediate delivery through your Metro distributor. Special gages and tools designed and produced to meet exacting specifications.

Write for Your Copy
New 36 Page
Metro General Catalog
No. 102

SPECIAL GAGES

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PLUG AND RING GAGES
All types, plain, progressive, extra long Plug Gages. Carbide Plug and Ring Gages.

THREAD PLUG AND RING GAGES
Manufactured in accordance with A. G. D. Standards. Gages precision lapped. Special gages to order.

CARBIDE TOOLS
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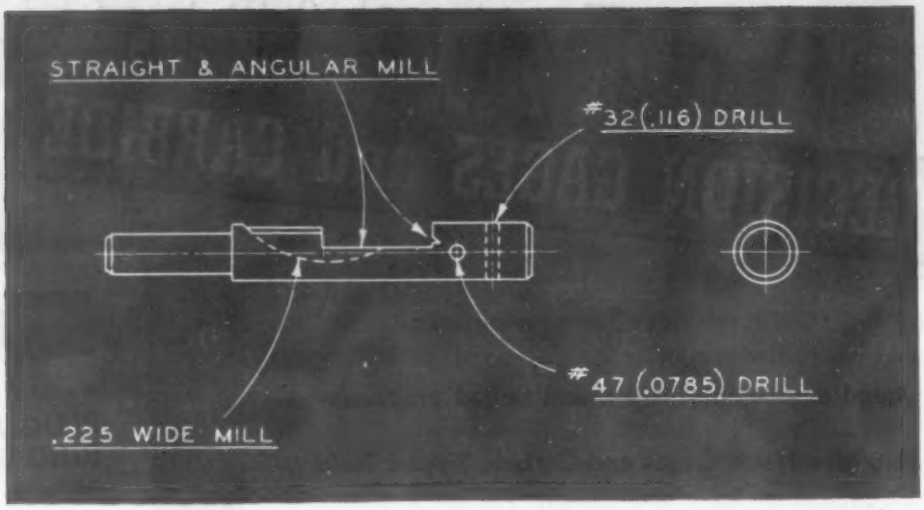


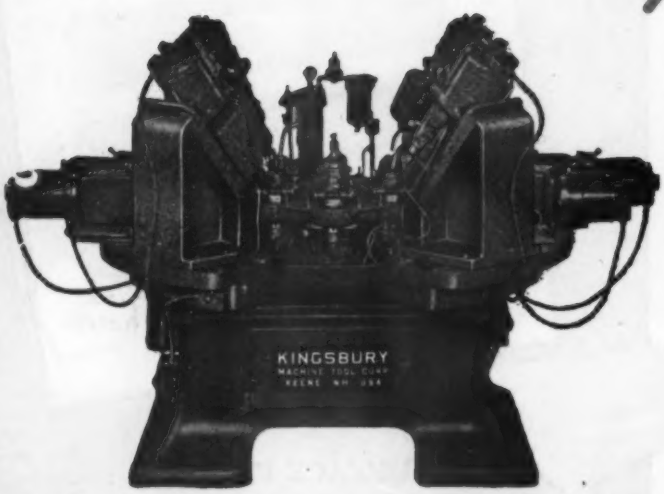
THIS IS A FLEXIMATIC

SMALL ARMS JOB!

Turning out rifle bolts to exact specifications under a fast production schedule

FLEXIMATIC

by KINGSBURY



Many vital needs of armament production are being met with FLEXIMATICS—the machines which perform a wide variety of machining operations in a single chucking of the work.

The Model GD FLEXIMATIC shown here performs various drilling and milling operations on rifle bolts—a job that calls for the highest in both precision and production.

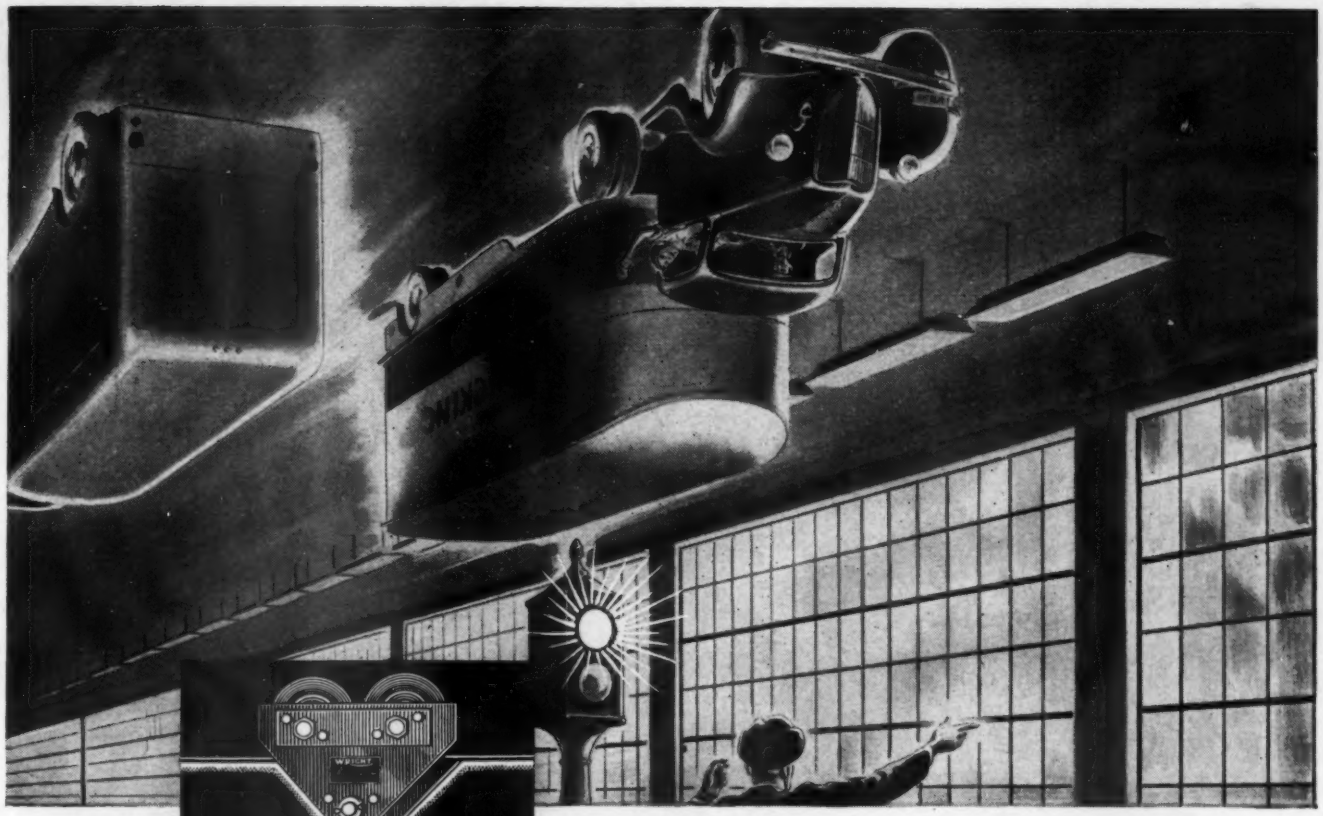
Contributing to the accuracy of the operations performed on this FLEXIMATIC is the mounting of milling spindles on Timken precision bearings. Further safeguarding of accuracy is achieved through driving each spindle by a cone worm and worm gear and dampening vibration by means of a heavy fly-wheel.

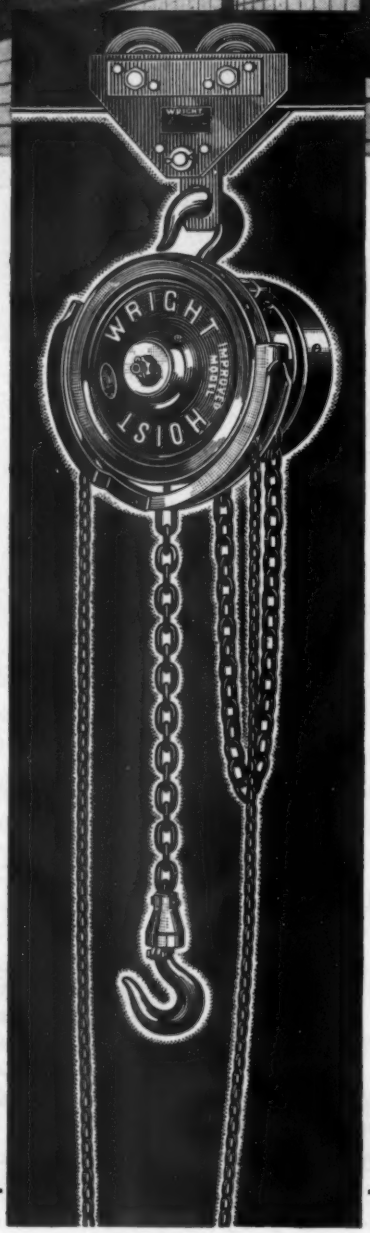
FLEXIMATICS are ideal for all classes of armament production where high accuracy and fast production with unskilled labor are every day conditions which must be met. FLEXIMATICS can, therefore, be depended on to make outstanding production contributions to National Defense.

Write today for illustrated Bulletin showing a number of different set-ups.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A





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WRIGHT engineers (and **WRIGHT** Hoists and Cranes) convert idle ceilings into production boulevards. **WRIGHT** Improved High Speed Hoists, **WRIGHT** *Speedway* Electric Hoists, and **WRIGHT** Cranes have long made possible fast, safe, economical, horizontal and vertical transportation of materials.

Your local **WRIGHT** distributor is well qualified to suggest methods for both speeding production and saving money. You will find him listed in your metropolitan classified telephone directory. If your problem is special, ask your distributor to call a **WRIGHT** engineer, who has had years of experience in solving material handling problems.

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FOR THE BEST DRESSED POST-WAR JOBS

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"FROM COTTON TO CUTTER"

America's leading air transport companies are typical customers for Reeves Army Twill. Whatever the industry, if uniforms are needed, this top-quality fabric tailors smartly and gives superb service. Over 80 million yards of it have already been used to help equip America's fighting men, and it is proving itself under the toughest climatic and combat conditions of global war. This fabric, Sanforized Shrunk* and color-fast to sun, water and perspiration, will meet *your* post-war uniform needs. When the time comes to order them, choose from a wide range of popular colors — insist on getting Reeves Army Twill.

**Residual shrinkage less than 1%*

THE REEVES FABRIC GROUP INCLUDES: *Reeves Army Twill • Glengarrie Poplin • Reeveking Gabardine • Byrd Cloth • Marine Herringbone • Reeves Sateen • Warrior Twill*

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PRODUCT OF THE MONTH

Texrope Super-7 V-Belts result from the cooperative research and design of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

MILWAUKEE, WIS. — Allis-Chalmers announces the Texrope Super-7-Steel . . . a new V-belt employing endless steel cables to provide greater horsepower transmission, reduce belt stretch. For proper applications of Super-7-Steel, check with nearby Allis-Chalmers district office or Texrope dealer.

A 1711

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ALLIS-CHALMERS MILWAUKEE · WISCONSIN

Tune in the Boston "Pops", Blue Network, Saturdays at 8:30 pm, EWT

HERE'S A "pin-up" idea FOR PRODUCT DESIGNERS..

Aluminum and Plastics work well as a team

An aluminum ring carries this Plexiglas* navigator's dome, serving as a strong, rigid mount in the plane. A plastic seal makes the assembly secure and weathertight. It's another case of aluminum and plastics working together to handle a difficult assignment well.

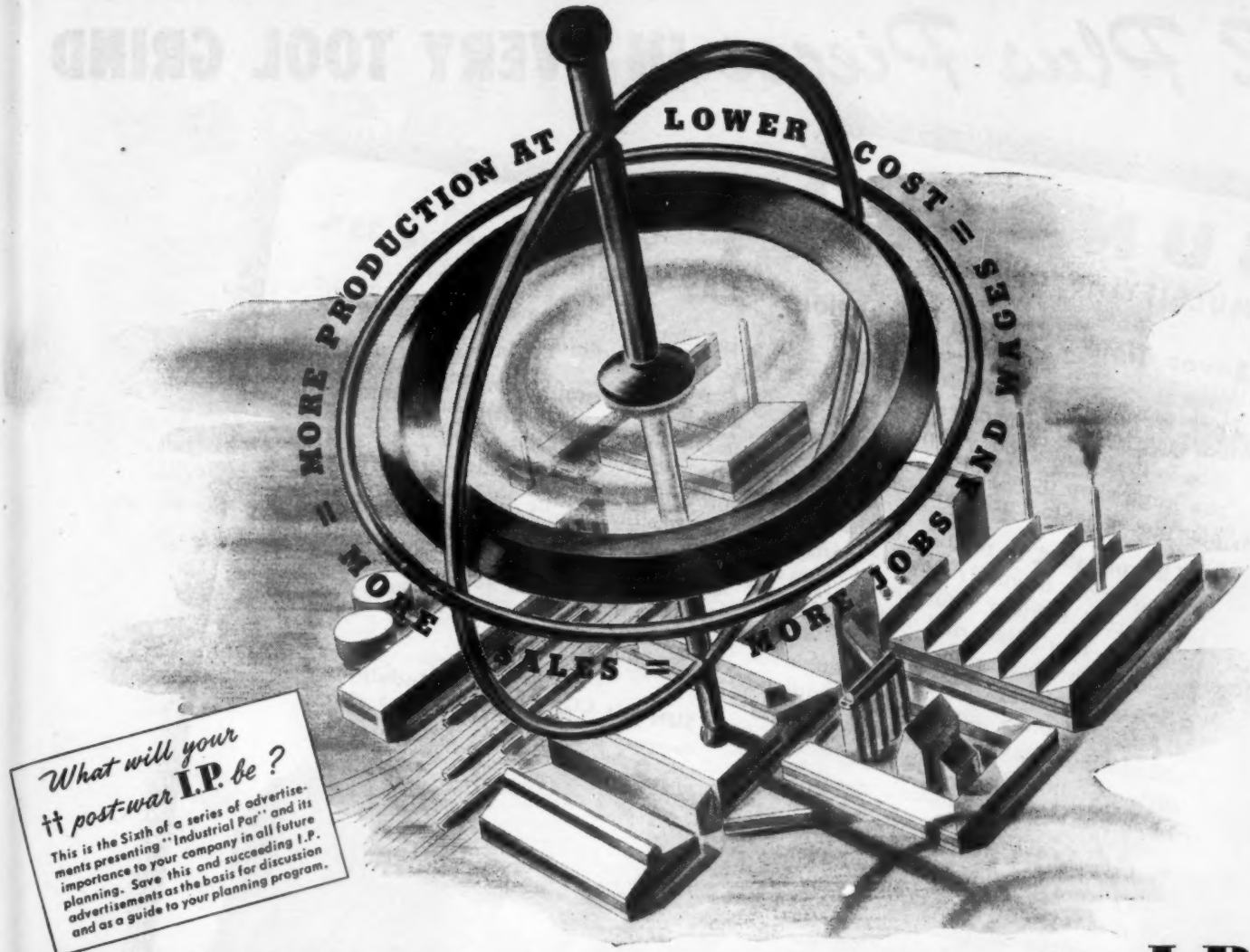
By using an extruded aluminum shape for the ring, metal is placed exactly where needed to receive the Plexiglas and its sealing ring. The extrusion method of manufacture supplements aluminum's natural light weight by making certain that there's no excess of metal employed. Formed and welded into a solid circle, production of this aluminum ring goes fast. Costs are moderate.

Wartime products contain a number of similar examples of aluminum and plastic teamwork, each material contributing some desirable property to the finished product. Designers of postwar products are certain to find this combination equally valuable.

Alcoa engineers will gladly give you the benefit of their experience in employing aluminum and plastics jointly. Write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

*Registered T. M. of Rohm & Haas Co.

ALCOA ALUMINUM



What will your †† *post-war* **I.P.** *be?*

This is the Sixth of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.

Keeping the Business Gyroscope Balanced Is All a Matter of I.P.

Remember the gyroscope you had as a kid. You gave it a flip with a bit of string and there it stood spinning and gracefully balanced. As it lost its spinning momentum it began to wobble, and finally, as its motion was spent, it just keeled over.

That toy gyroscope symbolizes an important principle in the making and selling of goods. When we are able to produce more at lower cost we sell more. When mechanical refrigerators cost about $400, they sold at the rate of 50,000 a year. When lowered production costs brought the price down to around $160.00, a million and a half were sold every year. Increased sales call for increased production and increased production means more jobs. More jobs and wages, in turn, contribute to making more sales possible and those, in turn, mean even greater production at still lower costs. As long as nothing disturbs the cycle the wheels of business and industry keep spinning in balance, like the gyroscope.

To produce more at lower cost calls for increased output per man-hour. America's industrial greatness was founded on the fact that we were able to increase our output per man-hour progressively through the years.

In fact, we have established a national industrial par — a constantly increasing output per man-hour equal to approximately 50% every 10 years. Our ability to maintain or excel this industrial par sets our level of national prosperity.

To increase output — to make better products at lower cost — demands production engineering skill, implemented with the best and most modern machine tools.

Machine tool productive power today is one-third to one-half greater than it was in 1939. Their increased effectiveness springs from vastly improved design and performance, rather than sheer numbers in use. Only with the most modern machine tools can any manufacturer hope to compete successfully over a period of years — make workers' jobs safer — more productive — more secure in the postwar days to come.

Let's All Back the Attack! **BUY MORE BONDS**

Spotlight facts for your post-war **I.P.** *planning*

*Production methods — developed in wartime — increase man-hour output; pent-up buying power — released in peacetime — demands increased production.

*The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.

*Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.

*Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*

*The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

Milwaukee Machine Tools

KEARNEY & TRECKER CORPORATION

MILWAUKEE 14, WISCONSIN

12 Plus Pieces IN EVERY TOOL GRIND

SUNOCO
EMULSIFYING CUTTING OIL

Saves Time . . . Ups Production . . . By Boosting Tool Life 33%

More production . . . less interruption — that's the goal of practically every machine shop in the country today. And here's how one large shop achieved it by getting 12 plus pieces per tool grind.

Tool life was short in relation to their production quota of vitally needed parts for mechanized fighting equipment. "Down-time" for regrinding and resetting tools meant lost production time. So they asked a Sun Oil Engineer what he could do about it. After a careful study he recommended a change in cutting oil . . . to Sunoco Emulsifying Cutting Oil . . . and suggested they run a test to prove Sunoco's merit.

Test showed 33% greater tool life with Sunoco. They were able to machine an average of 47 pieces per grind as against only 35 with the previous oil. Less interruptions for regrinding . . . more production. So Sunoco was adopted for all operations requiring a soluble cutting oil.

Your plant can profit, too, from the advantages of Sunoco Emulsifying Cutting Oil. The exceptional heat-absorbing and rust-preventing characteristics of Sunoco are responsible for its almost universal use where closest tolerances, finest finishes, speed of production and economy are required. Let Sunoco help you pack every man-hour and machine-hour with peak production. Write . . .

SUN OIL COMPANY • Philadelphia 3, Pa.

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SAVE and SERVE

WRITE FOR FOLDER ON SUN'S PLAN TO SAVE EQUIPMENT · TIME · LABOR WITH PROPER LUBRICATION

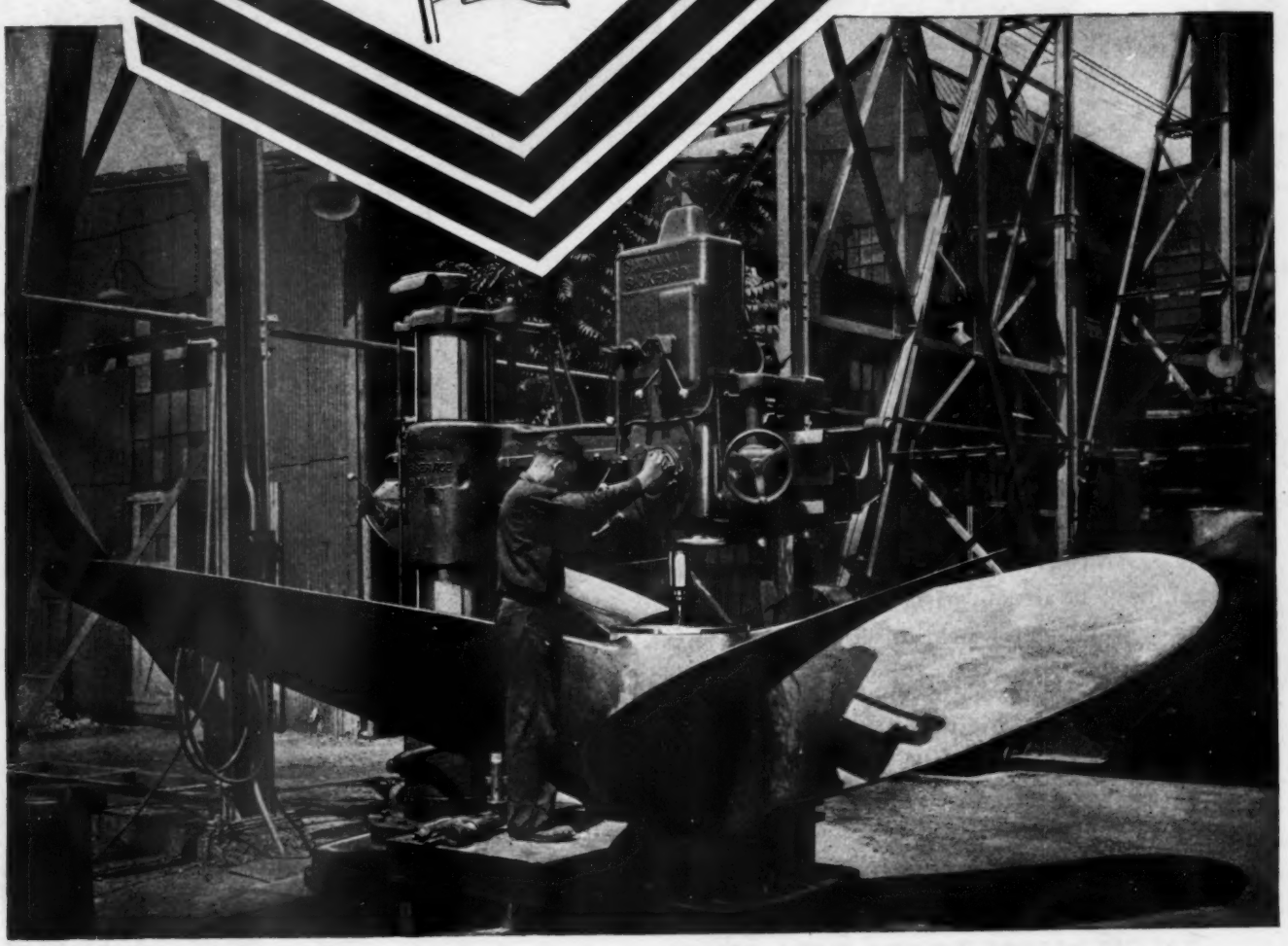
SUN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMERICA

PROPELLERS

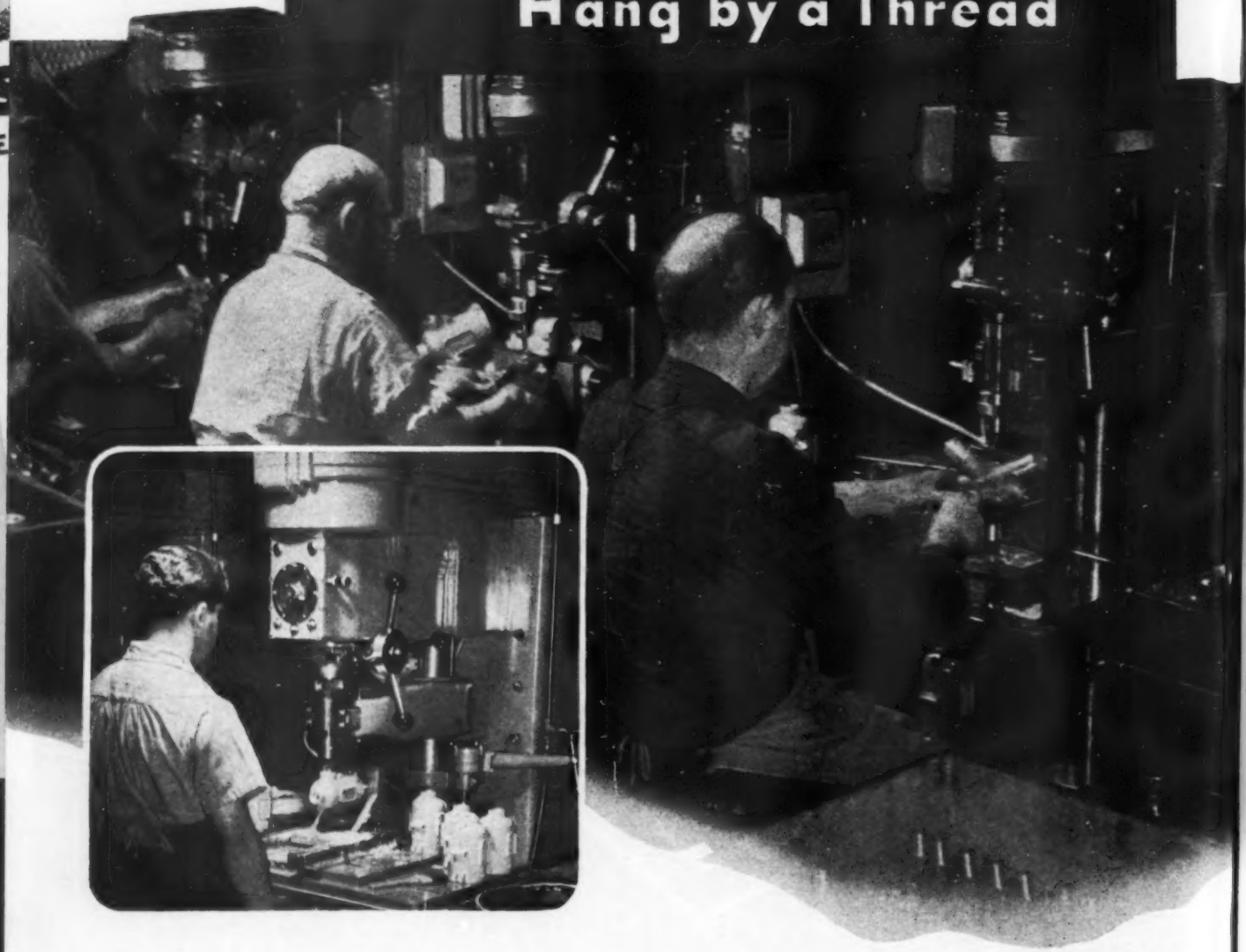
In a well known eastern plant, war orders for Liberty Ship and Tanker propellers required fast retooling. Before a building could be erected for this work, propellers were in production—as attested by this outdoor setup. The machine is an early type Super Service Radial, applied to the drilling and tapping of 12 holes in the hub-face. Precision locating from the keyway was specified, and a circular drill jig insured accurate center-to-center distances of all stud holes. Super Service Radials are applied to countless similar precision war jobs, often performing yeoman service 3 shifts per day, 7 days per week. The Super Service Radial's productivity, capacity, adaptability, reliability, accuracy and convenience are features of inestimable value to the war effort. Detailed information upon request. The Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio.

SUPER SERVICE RADIAL



Battery of Warner & Swasey No. 11 Precision Tapping and Threading Machines, and (below) a No. 12 in the Dayton plant of United Aircraft Products, Inc.

When Production Levels Hang by a Thread



THE United Aircraft Products Company, Dayton, Ohio, with plants in California and Ohio, was one of the very first to use Warner & Swasey Precision Tapping and Threading Machines. Its production is almost exclusively aircraft parts held to strict specifications of the U. S. Army Air Corps. Tapping operations on hundreds of aircraft parts call for Class 3 thread fits, with tap depth held to within ½ thread.

Such precision work on a production basis presented problems that have been completely solved by the new design and many improved features of Warner & Swasey Precision Tapping and Threading Machines. The new principle of lead screw with electrically actuated guide fingers to control tap travel practically eliminated thread inaccuracy. A safety clutch which releases in split second time should tap hit a hard spot or a jammed chip, saves spoiled threads and tap breakage. A dial gage set by the operator accurately controls tapping cut to determined depth.

WARNER & SWASEY *Precision*
TAPPING AND THREADING MACHINES
4 Models
Capacities 0-80 to 1½" in steels —to 2½" in soft metals and plastics.

Ask your Warner & Swasey representative to explain the revolutionary improvements—or write for catalog.

WARNER & SWASEY Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES

No Retreat

ALL OF US KNEW the invasion was coming. Guessing the date had become a popular topic. Yet the announcement of the landings in France was a shock.

So much is at stake in this greatest of military ventures that it must succeed. It has been planned so meticulously and thoroughly that chances of failure are reduced to a minimum.

Each of us can take pride in the fact that our fighting men are going into battle with the finest equipment in the world, and with plenty of it. The cry of too little and too late is no longer heard.

Little did Hitler think that America and Britain could pour into his European stronghold hundreds of thousands of men armed to the teeth, transported and supported by four thousand ships and eleven thousand planes.

Little did he think that the day would arrive when deadly bombing planes could shuttle at will across the Reich, leaving industrial and military devastation in their wake.

Little did he envision the industrial might of this country, which now is sending over Germany and her captive nations the "clouds of planes" that the French appealed for in those ill-fated days of 1940.

What Hitler is bitterly experiencing today is a foretaste of what Japan is sure to get. We have seen dress rehearsals of it in the Marshalls, in New Guinea, in the Carolines. It is only a matter of time until the blow will fall upon the Japanese mainland.

With these portents of victory, with the fighting in the far places of the earth mounting in intensity, we here at home must not let down.

There is no retreat for the boys assaulting Hitler's ramparts. There can be no retreat for us. Relaxation of our production efforts at this critical moment is unthinkable.

At this stage of the war, when we desire victory with the least loss of lives and in the shortest time, an overwhelming preponderance of battle equipment is essential. With it the allied forces can smother the enemy with the sheer weight of weapons.

Strikes and absenteeism have no place in the present scheme of things. They should be out for the duration. Management too should be tolerant and should have only one objective—to meet or exceed whatever production schedules our war leaders set.

Lassitude, indifference, personal greed and ambition fade into the background as our soldiers push deeper into Europe. Only one factor counts—we at home must back up the men at the front with everything they need, and with something to spare.

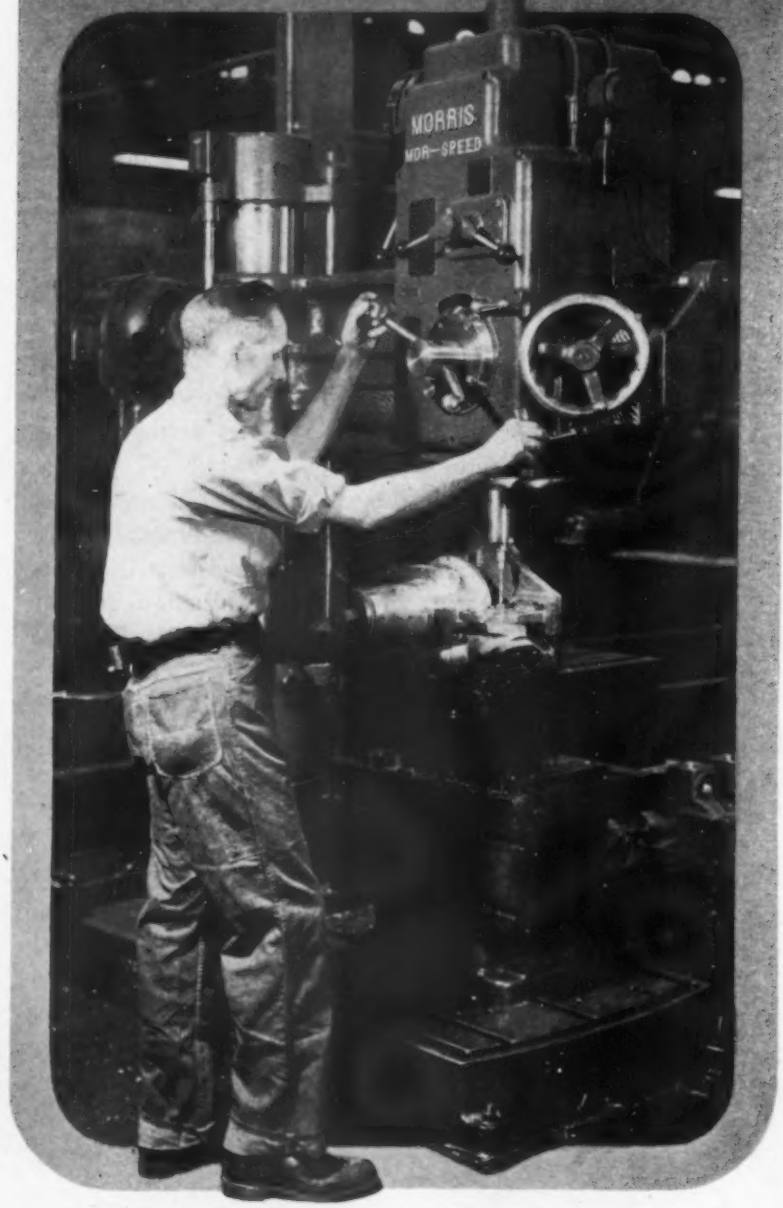
That is the least that they can and should expect of us.

Burnham Finney

MORRIS MOR-SPEED RADIALS

provide three essentials to good drilling

BALANCE—RIGIDITY—PRECISION



● With the head operating at the extreme end of the arm Morris Radials maintain close tolerances. The heavy, well-balanced arm and rigid construction from base to tip of column assure the utmost rigidity and provide accurate work under heavy feeds and high spindle speeds.

Other important construction points contributing both to high speeds and productive capacity are — all controls on the head, within easy reach of operator in normal working position — all speeds and feeds in the head made through sliding gears on spline shafts — gears have broached holes — shafts mounted on Timken Roller Bearings—forced feed lubrication throughout the head.

For simplicity of operation — accuracy and all around capacity — put your Radial work on a Morris Mor-Speed.

Full details as to design and construction and a wealth of engineering and operating data are included in the Morris Mor-Speed Radial Bulletin. Write for one today.

Standard sizes include 9" - 11" and 13" diameter columns.

Pratt & Whitney exclusive sales representatives for Morris Mor-Speed Radials in the U.S.A.

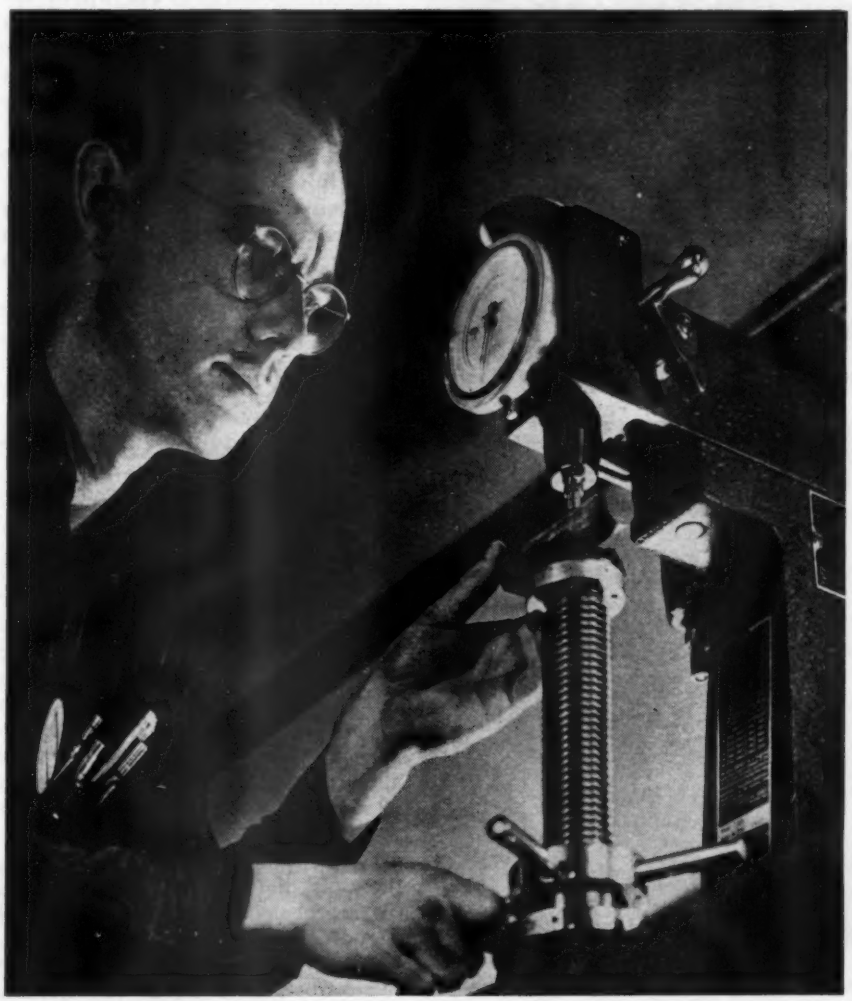
Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO

End-Quench Test Permits Rapid Evaluation of Steels

BY CHARLES M. PARKER, SECRETARY, GENERAL TECHNICAL COMMITTEE, AMERICAN IRON AND STEEL INSTITUTE



Taking hardness readings of steel on a Rockwell tester

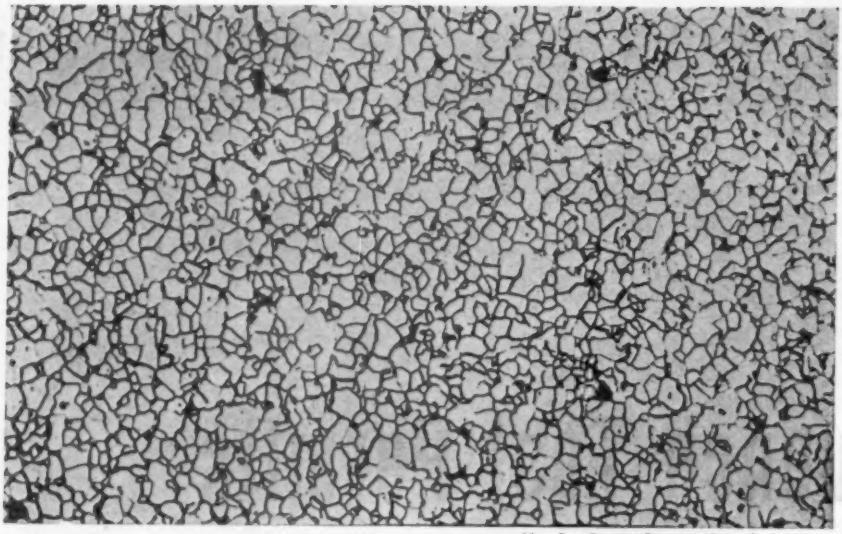
Possible interchangeability of various types of steel can be determined easily through use of end-quench hardenability test

FOR MANY YEARS it has been the custom of steel consumers and producers alike to describe steel in terms of its chemical composition limits and ranges. In the field of alloy steel this practice has been more pronounced than in the field of carbon steel, because alloy steels may contain many more elements which affect their range of usefulness than do carbon steels.

The original reason for describing steel in this fashion was an attempt to secure reproducibility of results. In the early days of steel technology, knowledge of the effects of the several elements on the mechanical properties of steel was much more imperfect than it is today. It was thought that any two heats of steel, the compositions of which fell within the same chemical limits, would perform in the same manner.

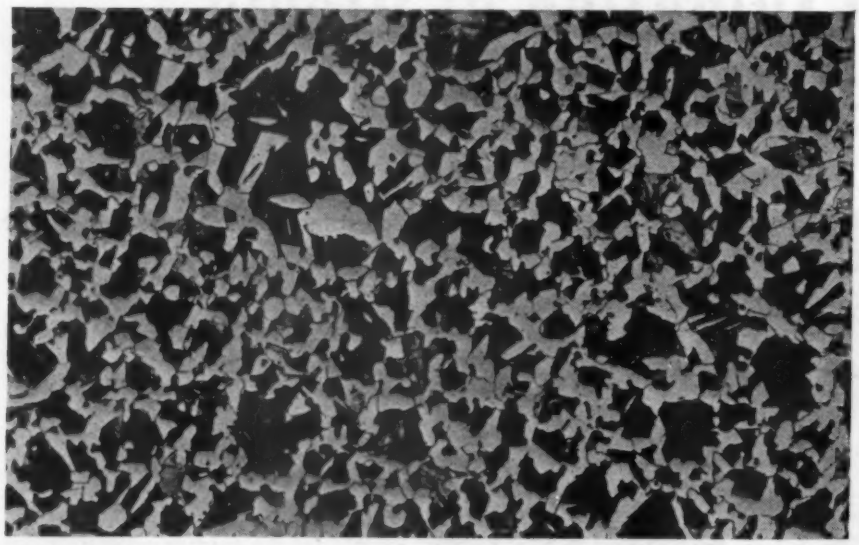
Today, it is known that this is not true—deoxidation practice and grain size, to name only two major variables, have profound effects not only on the mechanical properties of steel but on the more intangible properties of "personality" in such operations as forging and machining.

As new elements were brought into

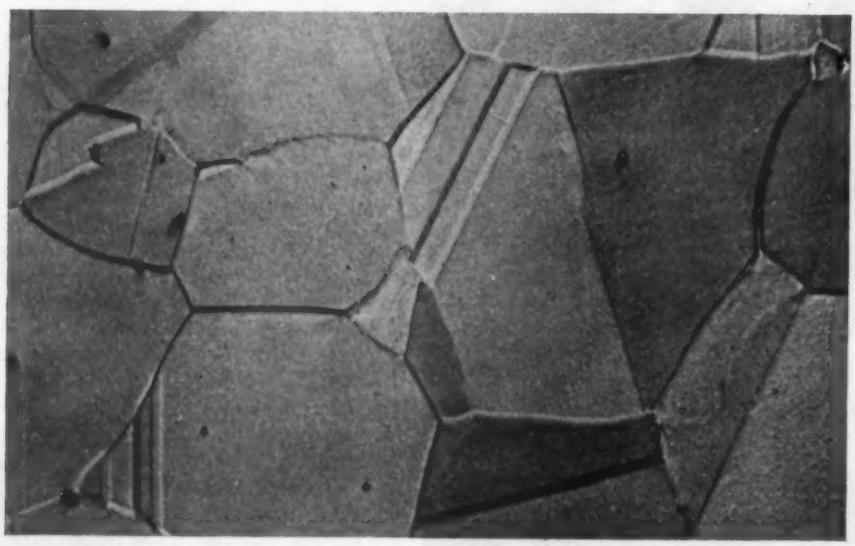


U. S. Steel Corporation Laboratory

Ferrite or alpha iron is shown in 0.05 percent carbon steel



Photomicrograph of ferrite and pearlite in 0.35 percent carbon steel



Formation of austenite, shown, represents the production of a solid solution of carbides in ferrite

use the formulas for alloy constructional steels increased until in 1940 one of the largest producers of alloy steels was melting more than 4,000 different compositions.

This condition was a most peculiar one when viewed wholly from a technical point of view. The mechanical properties of steel are largely dependent upon its microstructure, while the chemical composition controls the temperatures at which changes occur in the microstructure. The ability to change the microstructure at will makes steel the most versatile metal in existence.

Quenching Factors

The presence of greater or lesser amounts of manganese, nickel, chromium, molybdenum or vanadium, for example, changes the quenching temperature, the quenching media and the tempering technique, but when the many different types of alloy steel are properly heat-treated within their respective carbon content classes, the results achieved are so similar that a high degree of interchangeability in both processing and performance is possible.

Interchangeability is not wholly apparent from a study of the results of a tensile test, because such a test is static and does not provide any information relative to changes which take place within the test bar as a result of changes in the microstructure of the steel. In order to secure that information it is necessary to heat-treat many samples of different sizes, take test bars from each, and run a tensile test on each—a laborious procedure at best.

Therefore, a more simple test which will give quickly and easily information as to the microstructure of steel in various sizes when quenched in oil or water is of prime importance, especially today when the use of substitutes for better known steels is mandatory. Such a test is the standard end-quench hardenability test.

It has been shown by many investigators that the ordinary mechanical properties of steel such as tensile strength, yield point, reduction of area and elongation are a function of the hardness of the steel. It has also been shown that the hardness of any given steel is dependent upon the microstructure of the steel and not upon the alloy content. The alloy content works to increase the hardened volume, but it does not increase the maximum hardness. In turn, the microstructure and, therefore, the hardness of the steel is dependent upon the rate at which steel is cooled in quenching.

The two principal components of the microstructure of steel, whether carbon or alloy, are ferrite and carbide.

The mechanical properties of steel are controlled by the microstructure which, in turn, portrays the quantity of each component present and its distribution or dispersion.

The ultimate structure of an alloy steel is a complex interrelationship of intermetallic compounds and solid solutions. No matter what kind of an alloy constructional steel is studied there are only two desired constituents present in its microstructure: Ferrite and carbide. There are, of course, undesirable non-metallic inclusions.

Ferrite is alpha iron which acts as a solvent for the ferrite-strengthening elements, manganese, nickel and silicon, with which it forms substitutional solid solutions. Even when it contains substantial quantities of alloying elements, it is designated by the metallographic name ferrite.

The principal carbide found in steel is cementite—the carbide of iron and carbon having the formula Fe_3C. Manganese carbide Mn_3C is identical in pattern and symmetry with cementite and can effect a partial or complete interchange of atoms with it. Other carbide-forming elements of importance in alloy steels are chromium, molybdenum, tungsten, vanadium and titanium. Not all of these carbides are identical in form and structure with cementite; chromium, for example, forms a double carbide FeCrC as well as the single carbides Cr_4C and Cr_3C_2. The carbide-forming elements may also enter into substitutional solid solutions with iron, thereby performing a double function.

Austenite is transformed into martensite when hot steel is cooled suddenly. Martensite in 0.85 percent carbon steel is depicted

Slow cooling adjusts distribution of the carbides in ferrite to produce a coarse microstructure termed coarse pearlite, shown in 0.85 percent carbon steel

Heat-Treating Steel

Changing the microstructure of steel is the art of heat-treatment. To secure certain predetermined desired mechanical properties, steel is heated above a certain critical temperature at which its molecular structure changes, carbon and other carbide-forming elements such as chromium and molybdenum are dissolved and a solid solution of carbides in ferrite called austenite is formed.

If the hot steel is now cooled suddenly, or quenched as it is called, the austenite is transformed and a new component called martensite is formed. Martensite is a mechanical mixture of carbides and ferrite in a fine state of dispersion—the more rapid the cooling the finer the dispersion, and the harder the product. The cooling rate which just results in complete transformation of austenite to martensite or complete hardening, is known as the critical cooling rate.

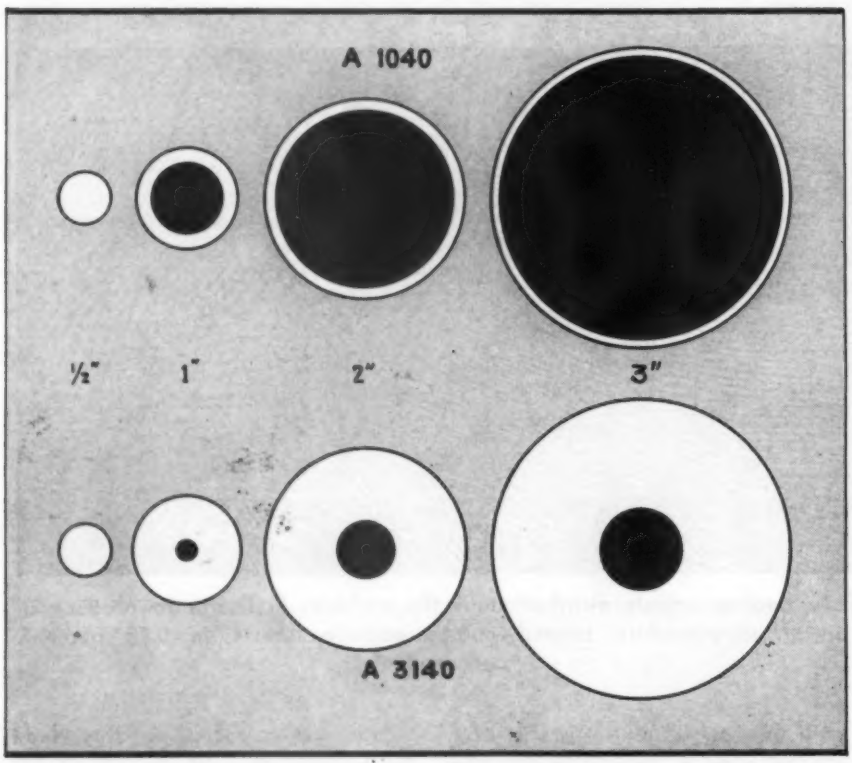
Since martensite is brittle a second heating and cooling called tempering is necessary to impart toughness. The tempering operation consists in heating steel to a predetermined temperature lower than the quenching temperature which will adjust the distribution of the carbides in the ferrite to form a coarser microstructure than that exhibited by martensite. This coarser structure, pearlite, is somewhat softer (less strong) and much more ductile than martensite. It is the structure present when the steel is put into service.

The foregoing explanation was based upon treating a piece of steel which was small enough to be cooled all the way through its cross-section at a rate equal to or in excess of the critical cooling rate; that is, the piece was hardened all the way through. If the section was so large that this could not happen then only that part of the austenite on the periphery of the piece would be transformed to martensite; the balance would be transformed to pearlite, a coarse mixture of carbides and ferrite and would gradually merge into the hardened martensite zone. Obviously then, the steel has not been hardened through and will not exhibit the superior physical properties of a steel which has been hardened through.

Pearlite Has Luster

Let us examine this coarse pearlite a bit more closely, because it is a most important structure in alloy steel. It is a mechanical mixture of ferrite and cementite, called pearlite because it

Faster cooling results in fine pearlite, shown in 0.85 percent carbon steel



Fully hardened areas in several sections of both carbon and alloy steel are illustrated. Carbon steel, A 1040, and the alloy steel, A 3140, were water-quenched from 1550 F. White areas indicate the fully hardened zones and the black areas portray the pearlitic zones

has a luster similar to mother-of-pearl. The ferrite phase is soft, ductile and relatively weak. It has a tensile strength of 40,000 to 50,000 lb. per sq. in.; an elongation of 40 percent; and a Brinell hardness of 90. It has no hardening power. The cementite phase, which consists of 6.6 percent carbon and 93.4 percent iron, has a tensile strength of about 325,000 lb. per sq. in. and a Brinell hardness of 650. It is extremely brittle.

Now, when the two are combined to form pearlite, this constituent has a tensile strength of 125,000 to 150,000 lb. per sq. in.; an elongation of 10 percent and a Brinell hardness of 250 to 300 dependent upon the fineness of the structure—the finer, the stronger.

The strength of pearlite varies with the thickness of the ferrite and cementite plates. In a eutectoid steel such as is shown in the photomicrographs, a plate thickness of 0.4 microns indicates a tensile strength of 100,000 lb. per sq. in., while a thickness of 0.25 microns indicates a tensile strength of 150,000. As the thickness decreases the plates deform to curvilinear shape and the tensile strength rises to 225,000 lb. per sq. in.

Hardening Technique

Our problem now is to induce the steel to harden throughout its cross-section. This is done by the use of the alloying elements manganese, nickel, chromium, silicon and molybdenum. All these elements lower the critical cooling rate, although not all are effective to the same degree, and permit the steel to harden to greater depths.

The influence of the alloying elements in performing this most useful function is probably threefold: (1) They change the distribution of the carbides in the ferrite matrix by reason of difference in volume; (2) they change the properties of the ferrite by dissolving in it; and (3) they change the quality or type of carbide as compared with iron carbide or cementite.

A follow-up article to appear in a forthcoming issue will explain and illustrate the standard end-quench hardenability test to show various conditions which occur in heat-treating bars of various sizes.

Keeping Shafts Straight

THE TENDENCY of long shafts, such as lead or feed screws, to go out of shape has always been a problem. Straightening cold bars of steel imposes stresses that have a way of coming out after they have been machined. Some straighten again after machining but even here the bars are not sure, or even likely, to stay put. So, after considerable study, one well known machine builder takes the bull by the horn and straightens the bars hot from the furnace, before machining at all.

The bars come out of the furnace red hot and go between revolving rollers, spaced near enough together to insure getting all the kinks out of the bar before it cools. The bars are rolled until they are cool enough to retain their straightness, then laid flat and supported their entire length until completely cool. This treatment has eliminated former troubles with shafts warping after being machined.

Drill Block Locates Holes in Jig Clips

VARIOUS ANGLE CLIPS are used in aircraft jigs for providing locating points. It is often important to locate an angular hole in the clip from a flat surface which comes in contact with the jig body. In order to provide a means of locating such holes, the Vultee Field Division, Consolidated Vultee Aircraft Corporation, has devised a precision drilling tool which is simple, but does the trick.

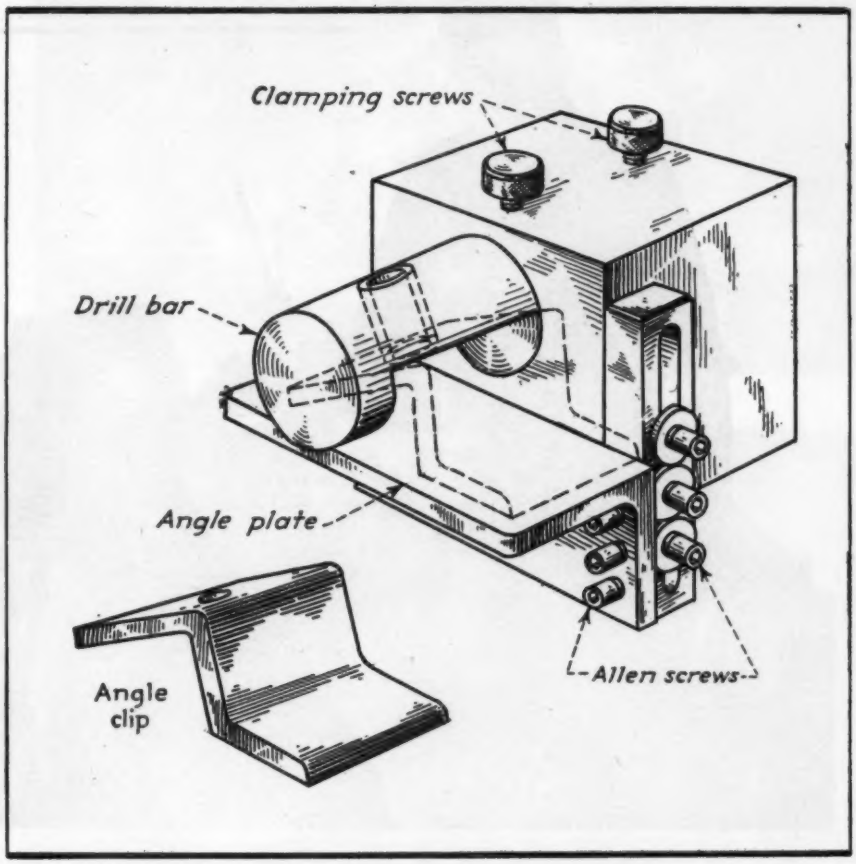
The tool consists of a heavy block which can be held in a vise. This block has an adjustable angle plate which forms a base for the clip and an adjustable drill bar cut away on one side to match the angular surface of the clip.

Referring to the sketch, an angle plate is adjustable vertically by means of Allen screws. The drill bar is milled and ground at exactly half the diameter and may be adjusted by loosening the screws on the top of the back. It will be noted that this bar may be adjusted as to angle and also longitudinally so that the position of the hole may be set from one end of the workpiece.

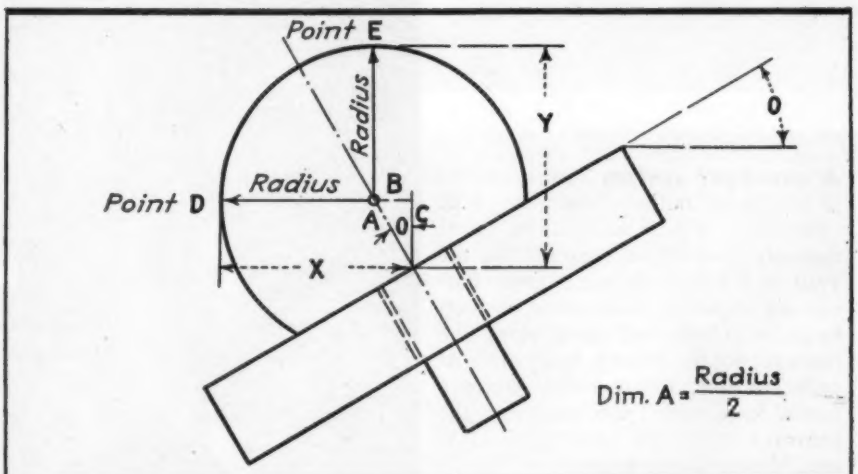
The hole may be bushed for any size of drill desired. An ordinary portable drill is used for machining the hole in the clip using the bushing as a guide. With this device, it is possible for an unskilled operator to work within a tolerance of ± 0.001 in.

In setting the drill block the angle is determined by a sine bar or protractor depending on the degree of accuracy desired. Then the relative positions of the angle plate and drill bar are fixed by means of a sine ball. While this is not a new device, it has been revised recently by one of the Vultee Field toolmakers and has been found to be very effective for the purpose of setting angles. A set of seven sine balls has been made up each of which has a different size of stud. The accompanying example will show how the calculations are made from the center point of the hole.

The sine balls are also used in checking the position of the clips in relation to the jig body. For instance, if a jig has a series of clips in a line or around a circumference, the holes in each may be checked by using a dial indicator based on the jig body with the point in contact with a sine ball with its stud in the clip hole. Any inaccuracies will be shown by deviations in the indicator needle as each clip is tested.



The height of the angle plate is set by the sine ball shown below



EXAMPLE 1

GIVEN: 0.875 DIA. BALL AND O=30°
TO FIND: X, USING POINT D AS A STARTING POINT

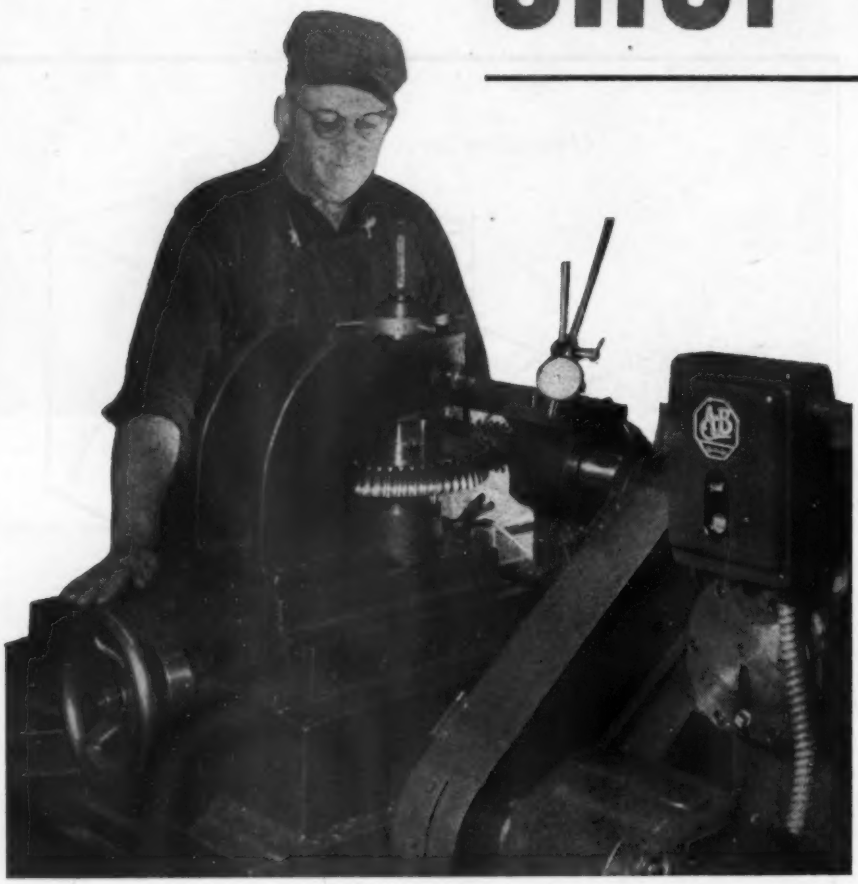
X=RADIUS+B
X=RADIUS+(A×SIN. O)
X=0.4375+(0.21875×0.5000)
X=0.4375+0.1094
X=0.5469

EXAMPLE 2

GIVEN: 0.875 DIA. BALL AND O=30°
TO FIND: Y, USING POINT E AS A STARTING POINT

Y=RADIUS+C
Y=RADIUS+(A×COS. O)
Y=0.4375+(0.21875×0.8660)
Y=0.4375+0.1894
Y=0.6269

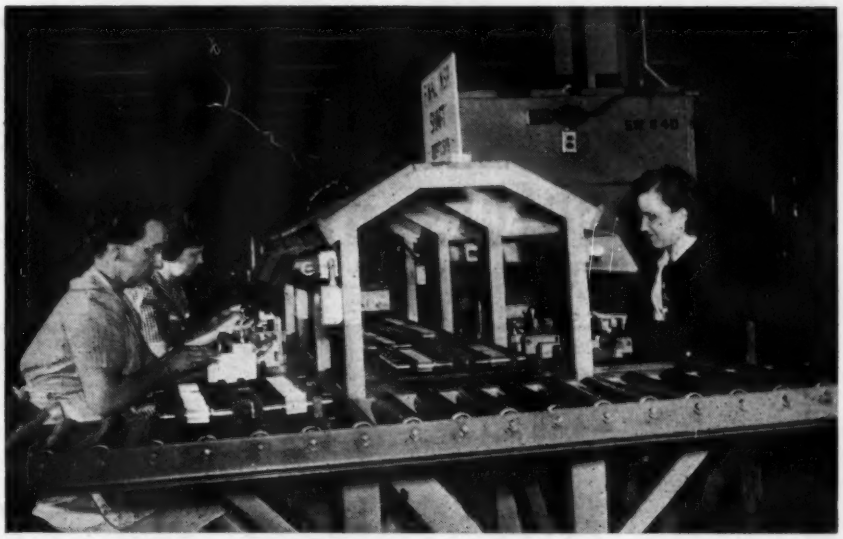
SHOP SHOTS



Worm gears for the traversing and elevating gear boxes which are a part of the carriage for the 155-mm. howitzer must be assembled without backlash, and must have a minimum tooth spacing error. To obtain this accuracy at a minimum of expense, Caterpillar tool engineers designed and built this "combing out" fixture. After a worm gear has been hobbed, it is mounted on the vertical spindle of this unit and "combed" or shaved with a specially designed hob to correct tooth form and spacing inaccuracies. The hob spindle is driven by a ¾-hp. motor and the worm wheel spindle is free to rotate, so that it is driven by contact with the hob. Little difficulty has been experienced with gear train inaccuracies since this fixture was put in use. Caterpillar Tractor Company.

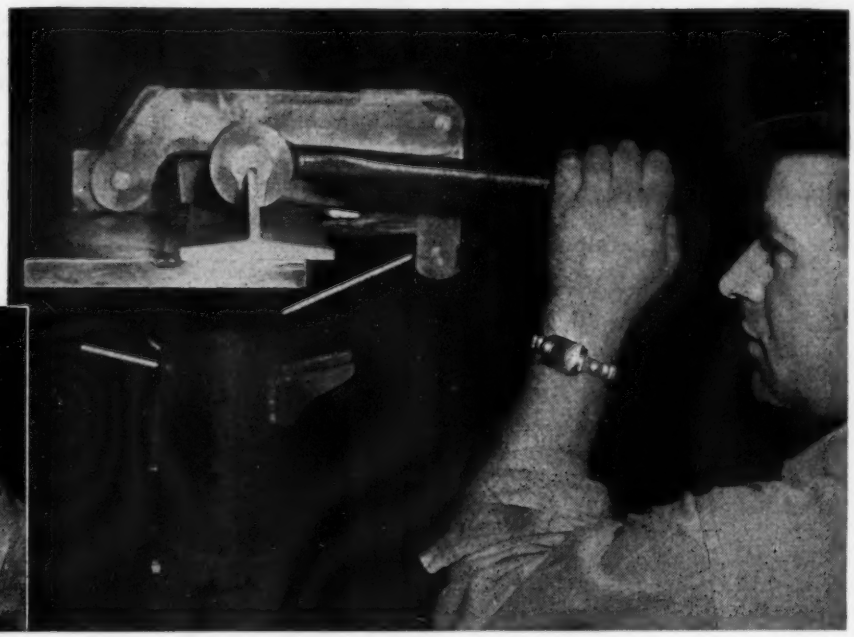
A conveyor system that resembles a miniature railway, complete with "switches," aids Chevrolet to speed the output of cylinder barrels for the Pratt & Whitney aircraft engine. Barrels are bolted in an inverted position to plate fixtures and move along the conveyor to the honing machines. At each machine, the operator rotates a turntable to switch the part from the conveyor to the machine table. General Motors Corporation.

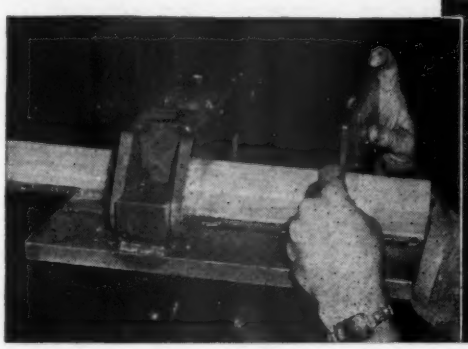
Inspection of detailed parts for Allison aircraft engine has been simplified through the development of a standard inspection bench. One of these benches is placed at the end of each conveyor line leading from a machine shop group to the conveyor line which delivers finished parts to the stockroom. Each bench has a work surface on either side of the feeder conveyor line to hold inspection gages and other tools when in use. The canopy serves both as a rack for gages not in immediate use, and as a screen for the fluorescent light tubes which illuminate the work areas. Allison Division, General Motors Corporation.



This two-handed safety device does not slow down production nor interfere with clear vision of the operation. The air cylinder of the press is controlled by a three-way valve manipulated with the left hand. In order to turn the valve the operator must have her right hand on a lever which is otherwise pulled down by a coil spring until it engages one of the teeth of a horizontal bar. The bar is attached to the air valve and cannot be moved when stopped by the lever. Westinghouse Electric & Manufacturing Co.

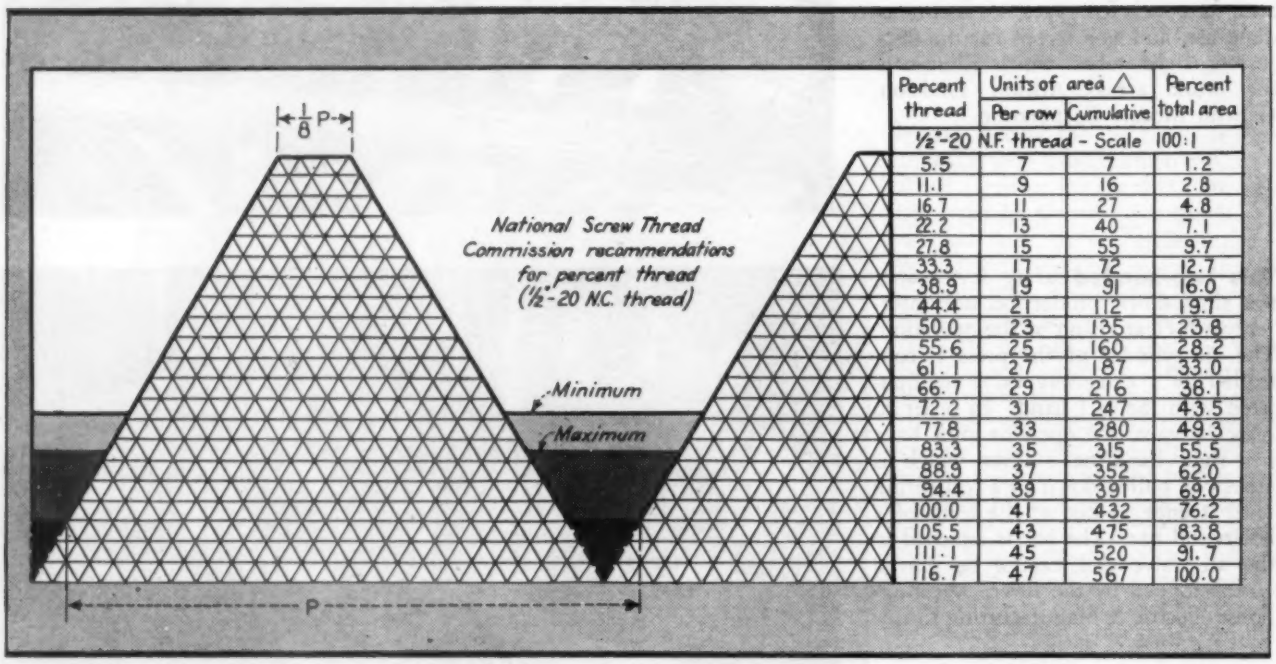
Extruded sections are often bent to suit the design of certain aircraft assemblies where quantities used do not justify ordering special extrusions. The bending operation is expedited by the use of a special bar and a welded-pipe floor stand to support the workpiece. The extrusion is held on the stand by means of a toggle clamp. The bar fits the center flange of a T-section to avoid undesired distortion. The degree of bend is then checked with a simple angle templet. Vultee Field Division, Consolidated-Vultee Aircraft Corporation.





Each tapping operation should be studied as to material cut, percentage of thread, tolerances, lubricants and machine ranges to produce satisfactory work

Many Factors Besides Taps Affect High-



Percent thread	Units of area △ Per row	Cumulative	Percent total area
½"-20 N.F. thread - Scale 100:1			
5.5	7	7	1.2
11.1	9	16	2.8
16.7	11	27	4.8
22.2	13	40	7.1
27.8	15	55	9.7
33.3	17	72	12.7
38.9	19	91	16.0
44.4	21	112	19.7
50.0	23	135	23.8
55.6	25	160	28.2
61.1	27	187	33.0
66.7	29	216	38.1
72.2	31	247	43.5
77.8	33	280	49.3
83.3	35	315	55.5
88.9	37	352	62.0
94.4	39	391	69.0
100.0	41	432	76.2
105.5	43	475	83.8
111.1	45	520	91.7
116.7	47	567	100.0

The relation between percent depth of thread and the amount of material removed by the tap is illustrated above. Too great a percentage of thread strains the tap unnecessarily

BY HERMAN GOLDBERG, CHIEF ENGINEER, R. G. HASKINS COMPANY

SIZE of a machine tapped hole can be controlled within close limits with the proper tap, correctly used. Tap manufacturers do not guarantee sizes of holes their taps will produce because of many factors that affect precision tapping. All that can be guaranteed is that tap size is within specified limits; then, if a tap does not produce a hole within its class there is something wrong elsewhere.

Tap manufacturers have been blamed for conditions over which they have no control. If the problem of tapping is understood there should be no difficulty in maintaining close-tolerance tapped holes. A tap is nothing more than a cutting tool and it should have the same care and consideration as would be given any other sharp-edge tool. From a practical as well as theoretical standpoint, standard taps will produce the following classes of fits if the proper procedures are used:

A cut thread tap will produce a Class 1, loose fit, threaded hole and in a small percentage of work will produce a Class 2 fit. Commercial ground thread taps will consistently tap a Class 2 fit. Precision ground thread taps made to a No. 01 tolerance will tap an interference Class 4 fit. A similar tap with a No. 1 tolerance will tap a Class 4 fit. When made to a No. 2 tolerance, a precision ground thread tap will produce a Class 3 fit, while a similar tap made to a No. 3 tolerance will usually tap a Class 3 fit to the high limit and is generally used where work must be plated or heat-treated.

Some tappers attempt to use commercial ground thread taps for Class 3 fits. While possible, the percentage that will consistently tap a Class 3 fit is small. Sometimes one or two commercial ground thread taps out of a dozen might do this; sometimes more, but usually less. While precision ground thread taps cost more than commercial ground thread taps, there is nothing gained by using the latter where precision fits are required, because of the difference in work quality.

Oversized holes, either in the entire length of the hole or part way, present the greatest problem in tapping to close tolerances. Many mechanics attempt to overcome oversized holes by using smaller tolerance pitch diameter taps to offset the oversized condition, but it is impractical to expect an undersized tap to cut consistantly oversize to a close tolerance. When taps of the proper tolerance do not tap within their size other conditions are at fault.

There are many who believe it is necessary that a tap float while tapping. With taps ground in the thread and having shanks which run true with

Speed Precision Tapping

the thread, there is no reason to use a floating holder, any more than it would be reasonable to "float" a milling cutter or lathe tool. Holes cannot be tapped to 0.001 in. tolerance with run out many times this amount. The same accuracy and rigidity is needed in a tapping spindle as in any machine tool.

It is even more important to have true running taps than to insure that other metal cutting tools run true, as most other metal cutting operations are concerned with only one dimension. In tapping consideration must be given to three dimensions—pitch diameter of the tapped hole and lead and angle of the thread. Holes cannot be tapped to close tolerances unless all of these dimensional elements are considered.

A tap held in a floating spindle will not produce consistently accurate holes. When pressure is applied to the spindle, the tap takes hold at a slightly different angle each time. Often an unnecessary strain is placed on the tap because of the angle at which it is working. As it starts to cut and enters the hole, the tendency is for a floating tap to wobble, and the angle of each thread shaves a slight amount of metal off the side of the thread being cut. When the tap is reversed, the tapped hole, being much larger than the tap itself, leaves no support for the tap and it cuts while running backwards. Any cutting tool that cuts while running backwards will dull very rapidly.

This part has a 5/6 in.-24 tapped hole ½ in. deep. A three-flute tap operated at 1,000 r.p.m. when cutting and at 2,000 r.p.m. when reversed taps 1,300 pieces per hour. Size of tap drill must be chosen carefully on such jobs

Chip room in tap flutes, and in the work, is another important factor in precision tapping. If there were no place for the chips to go, no hole could be tapped. Many improperly fluted taps are used, with lands too wide and with flutes too shallow. This causes tap breakage. When an improperly designed tap is used, chips have to crowd into the flutes. Often power required to break chips is more than power required for tapping. Pressure of the chip rolling into the flute packs it in tightly and the flute crowds more chips on top of the first. Going deeper, the chips pack tightly and when this happens the tap, being weaker than the machine, usually breaks.

Crowding of chips into the flutes will also cause trouble in holding size, especially when the chips pack, as they tend to force the tap to cut oversize. In addition, there is more danger when the tap reverses that the chip will reverse with the tap and cause loading.

Chips Can Be Controlled

There is no reason why chips from a tap should be any different from the chips produced by any other metal cutting tool. A tap can be designed and sharpened so that it will shear out the metal if the proper hook and shear angles are ground into the cutting faces. The size and length of the chips can be controlled accurately. To attain this free cutting action and proper control of chips, provision must be made for the chips. In blind holes there is only one place they can go, and that is into the flutes of the tap itself. Unless sufficient room is left beyond depth of tapped hole for chips, many difficulties will be experienced.

While a wobbly spindle or floating tap holder will cause variations in size, as will the crowding of chips, they are purely mechanical. There is a more serious reason for variations in tapped holes. This is loading, or pick-up, of metal on the surfaces of the tap. Loading causes most tap breakage. It is very critical in certain materials. Preliminary loading rarely can be seen with the naked eye. At first it is noticeable as a very light hair-line streak that looks like a dull silvered surface. This streak is embedded into

the grinding scratches on the tap, and with every hole tapped a little more metal is picked up, until finally it is above the surface of the tap. If we continue to use such a tap, eventually it will pick up sufficient metal to cause it to weld in the hole with the result, of course, that the tap breaks.

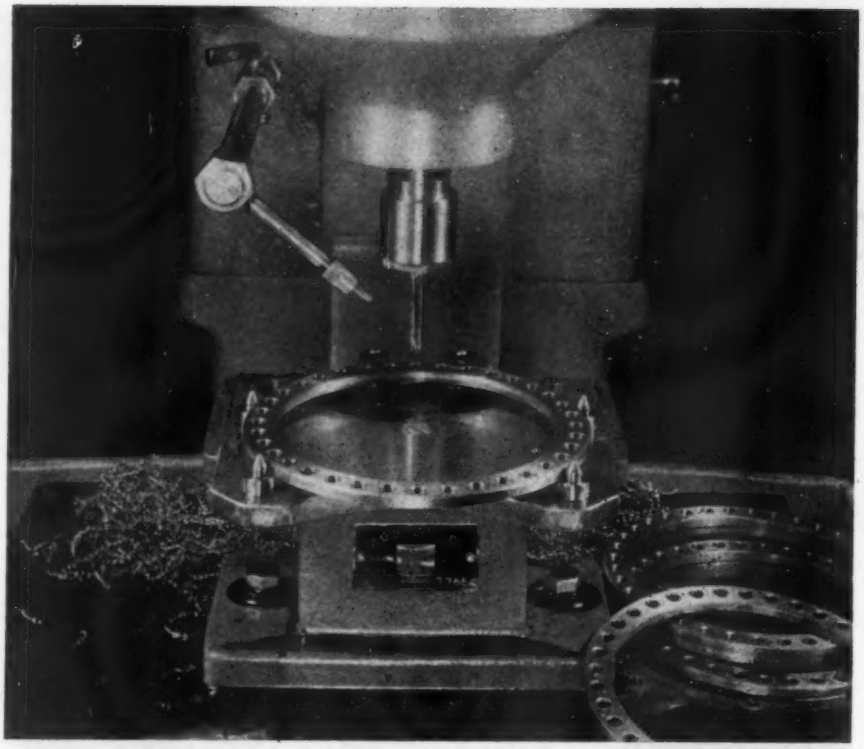
When a tap loads there is a noticeable increase in the size of the tapped hole. The threads also become slightly roughened and this further exaggerates the pick-up of metal.

There are several causes of tap loading. The cutting action of the tap causes a slight amount of expansion in the hole. Further expansion is caused by heat generated by friction of the tap as it is rotated into the hole. While this expansion is slight, it is there just the same. When the tap reaches the end of the hole and it is ready for reversal, the pressure of the cutting action is removed and there is a slight shrinkage while the tap is reversing. If this shrinkage is large it wipes out most of the cutting fluid and a slight pick-up of the metal takes place. Many materials are sensitive to this pick-up, others seem to have no affinity for the tap. Every grade of material will load at times if improper cutting fluids are used, if the wrong style of tap is employed, if lands are too wide, if chips are crowded into flutes, if the tap is dull, or if work is permitted to shift while tapping.

Generally, when tap loading occurs the first place to look for trouble is the cutting fluid. Sufficient, clean lubrication oil must be used to thoroughly lubricate the entire tap. Then, lands of the tap should be checked; because if they are too wide they will create too much friction, which exaggerates the pick-up of metal. Using narrower land taps will sometimes eliminate this trouble. When thin walls are encountered, and there is not sufficient support for the cutting action of the tap so that there is too great an expansion while tapping, there will be considerable shrinkage when the tap is reversed. This also can be overcome by narrowing the lands of the tap so as to have less frictional contact.

Machine Range Too Great

Range of many tapping machines is too great. Rather than being an advantage, this is often the reason for variations in tapped holes. As an example, many machines are rated from 0 to ⅜ in., or from 0 to ½ in. While it is true that a small tap can be used on a machine with capacity for a ½-in. tap, it is not very practical. A machine sturdy and rugged enough to tap a ½ in. hole is hardly light and sensitive enough for tapping with a No. 2, or even a No. 10 tap. On the other hand, if the machine is suitable for tapping with a No. 2 or No. 10 tap, it is hardly rugged enough for a ½-in. tap.



A simple, inexpensive fixture is all that is required for accurate tapping ¼ in.-28 holes in this 3/16-in. thick SAE 4140 steel motor flange when all conditions are correct. The part rests on the shoulders of six guide pins and is rotated manually. Hold-down clips are fitted on the two rear pins. Production is 50 pieces per hour when the two-flute gun tap is operated at 750 r.p.m. when cutting and at 1,500 r.p.m. when reversed

Percentage of depth of thread being tapped is an important factor in determining efficiency and economy of a tapping operation. Too great a percentage of thread throws unnecessary strain on teeth of the tap and serves no useful purpose. The greater the percentage of thread in tapped holes, the more power is required to tap, the more difficult it is to hold size, and the more chance of tap breakage, as more metal must be removed in a given time. Many difficulties in tapping are the direct result of attempting to tap too great a percentage of thread. Most mechanics do not realize the extra amount of power required when the size of the hole is reduced only a few percent. Even the generally accepted 70 to 75 percent depth of thread is difficult to produce with small size taps of the National Coarse series, as the smaller size taps in these pitches have to remove too great a percentage of metal in relation to their physical dimensions and strength.

To set up an arbitrary figure for a certain percentage of thread for each job running through an entire plant is wrong, as it would mean many difficulties in tapping some holes. It would be a very simple matter to tap a hole in brass with a 90 percent depth of thread, yet to attempt to do this in nickel steel, stainless steel, or any other alloy steels commonly used, would be disastrous. A 70 percent and sometimes even 60 percent depth of thread is difficult to tap in one operation in some of these materials.

As a general rule, the tougher the material the less percentage of thread should be employed. It is difficult to tap even 60 percent depth of thread in stainless steel, monel, copper and some of the heat-treated alloy steels. Manufacturers who have studied this problem have reduced percentage of thread in materials, in many cases, to as low as 50 percent depth of thread without sacrificing usefulness of the tapped hole for the purpose intended.

In tapping to close tolerances, such as Class 3 or Class 4 threads, difficulties in maintaining size are multiplied many times when too great a percentage of depth of thread is tapped. In rare cases where a greater percentage of thread is necessary, and close tolerance must be maintained, it is more practical

and economical to tap in two operations, using an undersized tap for the first operation and a second tap merely to size the hole.

Many published tables of tap drill sizes are not usable because the drill error is sometimes too great for the finer pitches. A table may show a certain size tap drill to give approximately 75 percent depth of thread, yet it actually may be as low as 65 percent or as high as 85 percent. This is too great an error. Standard drills do not always produce the percentage of thread desired. Often one size is entirely too large while the next size smaller is entirely too small. Millimeter drills in a good many instances will fit in between standard drills and give percentage of thread desired.

A good example of this is the ½ in.-20 tap. If an 80 percent thread is desired there is no standard or metric drill that will give the required hole. A special drill would be required, since the nearest would be 7/16 in., which would give us 96 percent depth of thread. The next size larger would be a 29/64-in. drill, giving 72 percent depth of thread. Some designers and engineers probably would specify a 7/16-in. drill to be sure of securing the desired thread. This would cause considerable tapping trouble.

Another good example is the very common No. 8-32 size. In this size, with standard drills, it is not possible to tap 70 to 75 percent depth of thread, as a No. 28 drill gives 58 percent, a No. 29 drill gives 69 percent, and a No. 30 drill gives 87 percent depth of thread. For those who want at least 70 percent depth of thread, a 3.40-mm. drill gives 74 percent. One drill manufacturer is supplying sizes of drills in between the regular sizes, and in many cases it is well to use some of these special drills. The cost of such a drill, as a general rule, is much less than the cost of the tap.

Standards Should Be Set

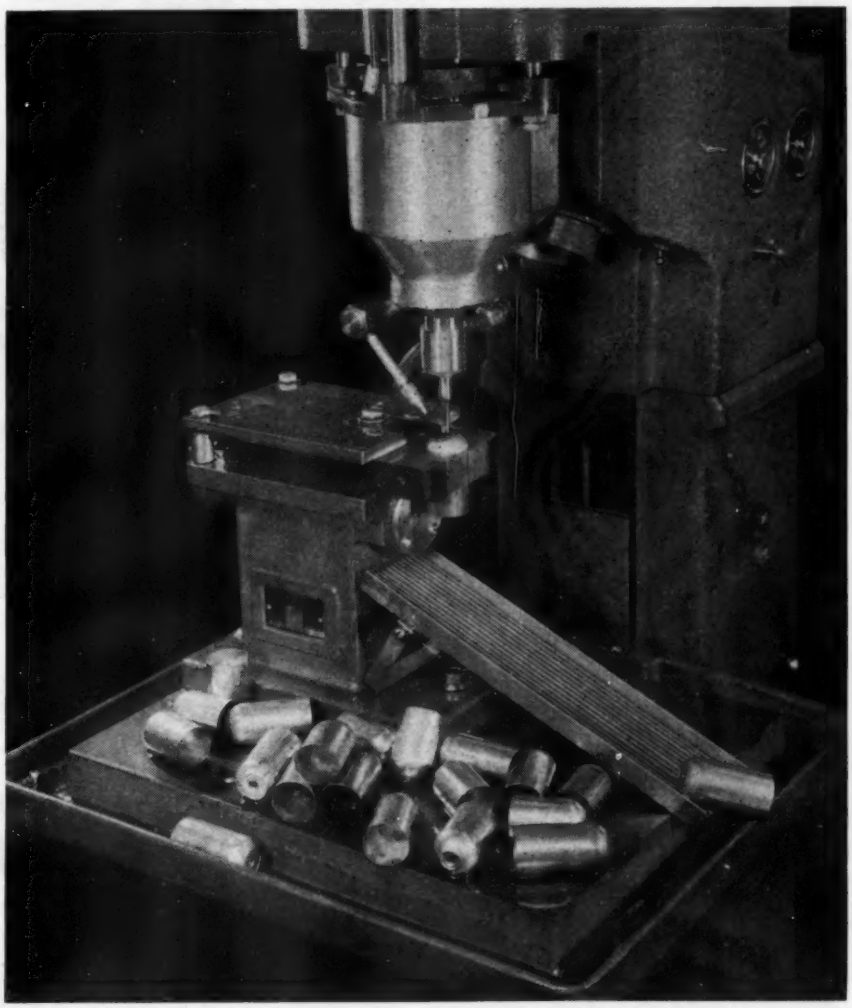
Each plant should set definite standards for the percentage depth of thread in various sizes of tapped holes so as to fit each job and material. If this is done intelligently, small sizes and coarser pitches will have much less percentage of depth of thread than the larger diameters and finer pitches. This involves no great amount of engineering, as it is a simple matter to study the tables and decide what percentage of thread should be used for each job. The saving in tap breakage and spoiled work, plus the troublesome problem of trying to maintain size, will be tremendous without in any way sacrificing the usefulness or strength of the tapped holes.

The National Screw Thread Commission set definite limits for minor diameter in nuts that are tapped, for both National Coarse and National Fine series threads, and provided a depth not less than 60 to 75 percent, depending on the size, and not more than 83 1/3 percent of the basic thread depth. These percentages have ample margins for safety, so that even in the case of a maximum size nut and a minimum size screw, which would give the loosest possible conditon for each class of fit, the screw will break before the thread will strip in the tapped hole. There is no reason why, in the average run of commercial work, these percentages should be exceeded.

The percentage depth of thread in a tapped hole should be governed by the diameter and pitch of the tap, the hardness and toughness of the material being tapped, and the depth of the tapped hole. The smaller the diameter and the coarser the pitch of the tap, the smaller percentage depth of thread that should be tapped. The hardness and toughness of the material governs to a great extent the amount of material a tap will remove. Generally, the harder and tougher the material, the lower the percentage depth of thread.

When too great a percentage depth of thread is being tapped, the hole is reamed out. This is due to the excessive pressure required—before the tap can take hold the chamfer starts reaming instead of cutting the thread. With proper percentage depth of thread, very little pressure is required to start a tap. When too great a pressure is applied, the tap lacks support in the thread and cuts away each succeeding thread as the tap revolves. This frequently happens in automatic screw machines when the cams are not correct for lead of the tap.

The next article in this series will appear in an early number.



Drawn brass radiator valve bodies are tapped at the rate of 1,200 pieces per hour with this set-up. The three-flute No. 14-40 tap is operated at 1,000 r.p.m. when cutting and at 2,000 r.p.m. when reversed. The air-operated vise has half-round jaws

Machine Tools Modernized Through Arc Welded Motor Drives

BY JOHN P. BERKELEY, CHIEF ENGINEER, BERKELEY EQUIPMENT COMPANY

THE ADVANTAGES of individual motor drives for machine tools are too well known to merit any detailed discussion but there are still many machine tools giving faithful service that were built before self-contained units were the rule rather than the exception. Thus there is still a place for machine modernization through the addition of individualized drives.

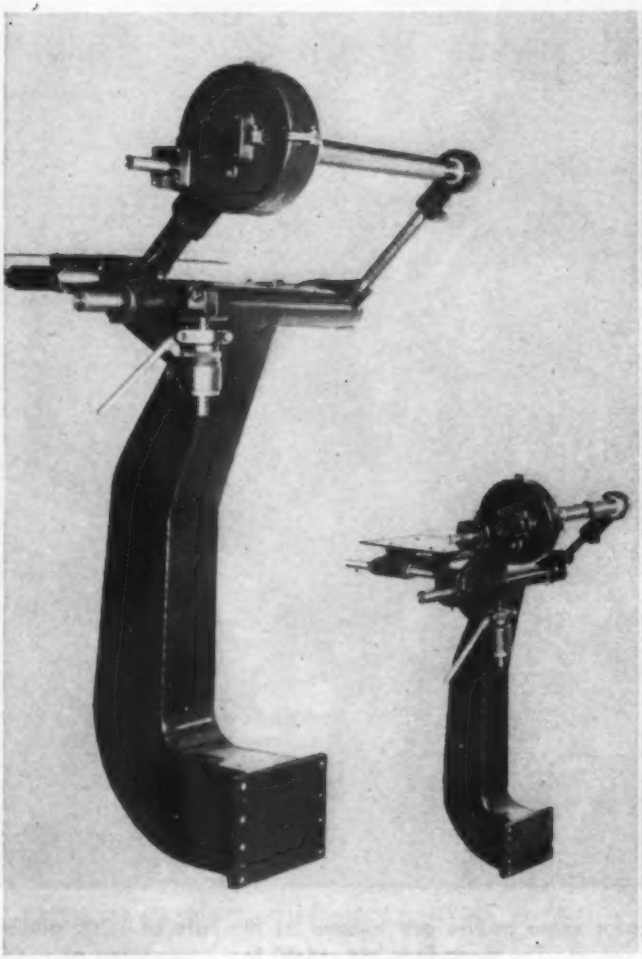
In choosing a motor drive for a machine there are but two alternatives, those with cast iron columns and those of arc-welded construction. It is the belief of this company that the latter

Welded steel motor drives give better service, can be made to fit application better and cost considerably less than cast iron drives made for comparable use

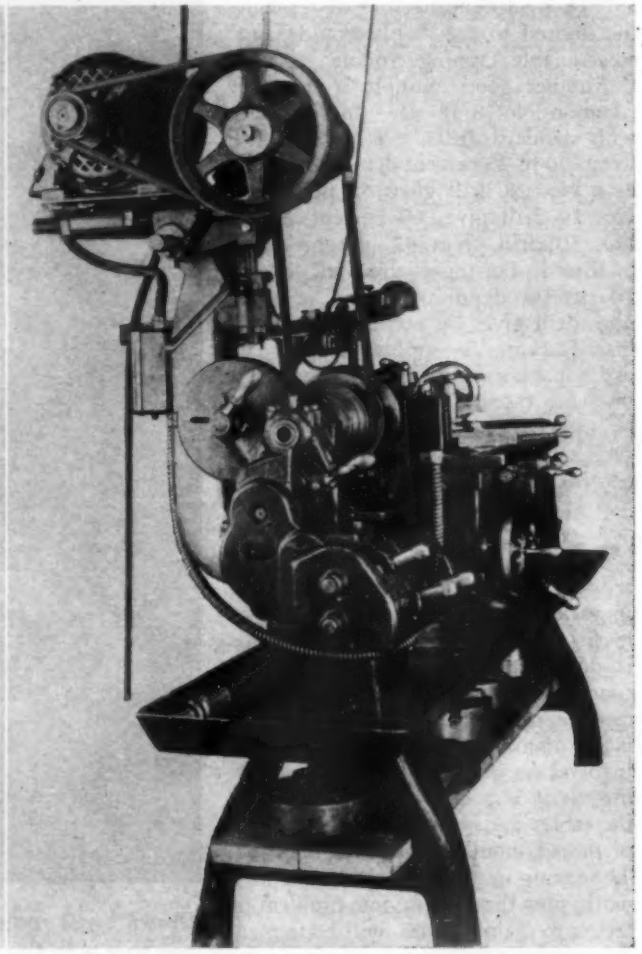
have many points of superiority in addition to a cost saving in their manufacture. These include less weight, greater absorption of shock and the possibility of making a design for any conceivable application, without going to the expense of making patterns.

The sequence of operations in fabricating an arc welded motor drive is simple. The first step is to check the machine to be modernized with others so treated. If a motor drive has already been developed for such a machine, the answer is obvious, but if no suitable drawing is available, a new drive is laid out.

From engineering, the completed design is sent to the stockroom, where necessary finished parts are selected. Parts taken from the stockroom are



Welded steel box section drive columns. This type construction results in a clean appearance



Welded steel drive with box section column applied to an engine lathe

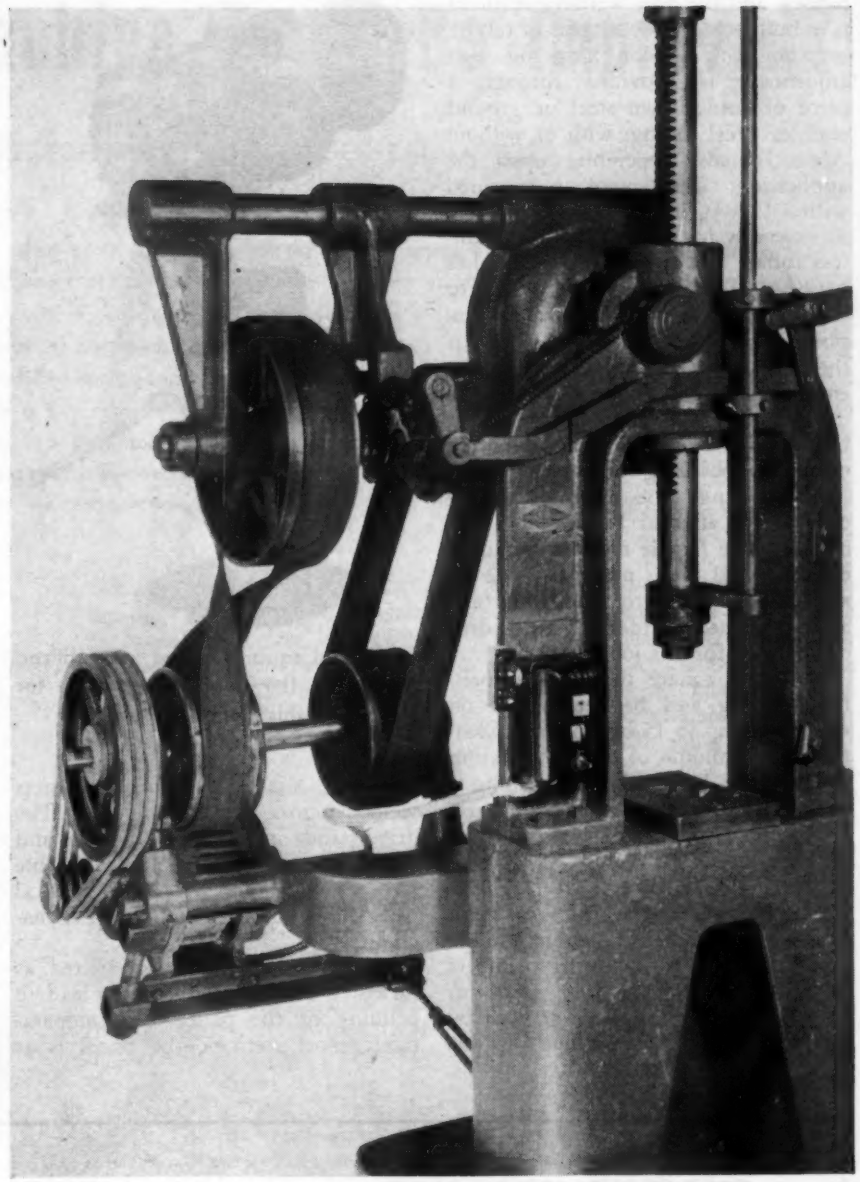
divided into two classes: those which go directly to assembly, and those incorporated into the column in the welding department.

Arc welded motor drives can be divided into three main classifications:
1. Welded steel box section columns
2. Structural square tubing assemblies
3. Flat panel supports

Each type presents individual production problems, so each will be considered separately.

Welded Steel Box Section Columns are made from 3/16-in. and ¼-in. hot rolled plate. When drive parts go to the welding room, a template of the column accompanies them. The side panels of the column are cut to the required shape by means of a flame cutting pantograph. The two side panels are cut separately, lightly tacked together and ground smooth.

After they are ground, the two side panels are tacked to the base plate and head piece. Sheared plates of the correct width are bent and then tacked to the side panels to complete the box section. Tacks are made every three or four inches in order to minimize distortion from welding. If the column is exceptionally large, internal bracing is added before the tacking operation is completed. This bracing eliminates any tendency for the column to weave or vibrate under load. For drive sizes under 7½ hp., internal struts are seldom used.



Vertical broach modernized by addition of welded steel motor drive

Heavy-duty 15-hp. motor drives with welded steel construction throughout. Two tie-bars provide additional support

After tacking all parts in place, the column is finish welded. On heavy fillets, such as that which joins the column to the base plate, a 3/16-in. fillet rod is used. This gives a smooth, concave bead which requires no finishing. It is usually completed in one pass. The column proper is welded with a poor fit-up rod 5/32 in. in diameter. Corner welds are completed in one pass, downhand, by the use of a small circular weave, which makes a smooth weld requiring less grinding. The top end of the column fits around the head piece—usually a length of tubing or pipe of suitable diameter. The head piece is welded to the column by a figure eight or long weave weld.

There is no advantage in using a deep penetration rod for this work. No stress approaching the tensile strength of the metal is ever applied to a column and a "hot" rod tends to burn through in spots where fit-up is not good. Coated rods are used to obtain greater ductility and purity of weld metal.

The problem of work distortion due to contraction of weld metal is not serious. Careful welding in a set sequence controls distortion to a large extent. Opposite corners are welded first, then the base plate and finally the head piece. If a plate bows to any extent it is straightened in an air press. On close work, the weld is stressed with an air hammer.

Structural Square Tubing Assemblies are rather inexpensive, as box sections are already provided in the

tubing, and the only welding required is in butt welding the lengths of tubing together with a poor fit-up rod. Belt adjustment is provided through a piece of cold drawn steel or ground seamless steel tubing, with or without Acme threads, depending upon the application. This piece is provided with a $\frac{1}{2} \times \frac{1}{8}$ in. keyway. The whole subassembly fits into a socket of seamless tubing. After the two assemblies have been lined up, a key is welded to the female assembly. This is accomplished by bending the last $\frac{1}{4}$ in. of the key to a right angle so that the ends project through two $\frac{1}{2}$-in. holes drilled near ends of the tube. The half-inch hole is then filled with weld metal, immobilizing the key.

The sliding tube assembly is the only thing affected by welding distortion. The female member is pulled out of round by as much as 1/32 in. and it is necessary to ream each tube after it has been welded. A radial drill can be used for this job.

Structural square tubing is surprisingly strong and has been used on drive units up to 15-hp. in size. Compared to a column of the same section welded from $\frac{1}{4}$-in. plate, the tubing is about 60 percent cheaper, but its use is restricted to short spans and vertical members.

Flat Panel Supports, the third main classification of drives, embrace those units whose main supporting members are flame-cut from $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ and 1-in. plate. The largest drive ever built by this company is of this type. It was

Structural square tubing was utilized in making the small motor drive for this bench lathe

made of 1-in. plate with stiffeners welded across the bottom side. The drive stands in a horizontal plane and is held in place by four adjustable screws, which are welded to vertical pads of $\frac{3}{8}$-in. plate bolted to the machine.

The use of panels is restricted as excessive unsupported lengths lead to bending of the plate. For comparatively short sections, the panel is as satisfactory as any box-section could be. It is a cheap type of unit to build for the only welding required is in the mounting of various pads on the panel. These are attached by means of positional fillets or butt welds.

To illustrate the impracticability of attempting to build a cast drive equal in performance to an arc welded drive we decided to build a cast iron unit to fit average lathes and screw machines. Features of the welded steel drive were to be duplicated as far as possible.

A box-section column was designed with careful attention to wall thicknesses. All mating parts were carefully machined to make them fit closely together. When the job was done we found the resultant drive to be inferior in performance to the welded drive and that its cost was greater by 34 percent.

Cost data of this cast drive compared to that of the welded unit is given in the table. Only labor and material costs are considered, without taking into account engineering expense and finished materials that are used.

Conclusions drawn from operating the two drive types are that the welded steel drive allowed the production of superior work, that a five percent increase in production can be established and that if a cast drive is designed to equal performance of a similar arc welded unit the cost is exorbitant.

This article is based on a paper by Mr. Berkeley entered in the last James F. Lincoln Arc Welding Foundation competition.

CAST TRANSMISSION DRIVE

MATERIAL				COST
Column	58 lb.	@	$0.09	$5.22
Head Casting	32 lb.	@	0.08	2.56
Ram	19 lb.	@	0.065	1.23
Motor Arms	10 lb.	@	0.075	0.75
Clamps	5 lb.	@	0.10	0.50
Total				$10.26

LABOR				
Column				$2.75
Head Casting				1.07
Ram				1.04
Motor Arms				0.70
Clamp				0.21
Assembly				0.60
Total				$6.37
Total Cost, Material and Labor				**$16.63**

WELDED STEEL DRIVE

MATERIAL				COST
3/16-in. plate	35 lb.	@	$4.60/cwt	$1.61
¾x6-in. H.R.S.	11 lb.	@	3.65/cwt	0.40
2½-in. pipe	8 in.	@	23.54/100 ft.	0.15
Seamless S. Tubing	14 in.	@	63.92/100 ft.	0.76
2½-in. round C.D.S.	20 in.	@	5.04/cwt	1.40
¼-in. plate	8 lb.	@	4.75/cwt	0.38
½x8-in. bar	7 lb.	@	4.74/cwt	0.33
Total				$5.03

LABOR				
Cut	0.5 hr.	@	$1.00	$0.50
Weld	2.7 hr.	@	0.85	2.29
Grind	1.0 hr.	@	0.55	0.55
Machine Work	1.4 hr.	@	0.70	0.98
Ream	0.8 hr.	@	0.60	0.48
Assembly	0.8 hr.	@	0.70	0.56
Total				$5.36
Total Cost, Material and Labor				**$10.39**

How Can Machine Tools Be Improved?

BY H. T. JOHNSON, DIRECTOR OF STANDARDS, GENERAL MOTORS CORPORATION

Machine tool builders and users alike have a stake in the development of simple efficient metal-working equipment. But often vital points in design are discussed only in whispers for fear of stepping on someone's toes or creating competitive antagonism. It is refreshing therefore to have a key man in the employ of one of the country's top machine-tool buying companies forthrightly express his views. The author poses ten questions on machine-tool design—and gives the answers also. The answers are more than an expression of one man's ideas as the questions were sent to master mechanics and plant engineers in General Motors divisions for comment. The conclusions as stated here represent a consensus.

Do you agree with them? Or can you add ideas of your own that will be constructive in the betterment of future machine-tool design?

Question 1—*Is there a need for more standardization on the part of machine tool builders?*

The answer to this question from every division was "yes"—some of the items covered in their answers are as follows:

1. Standardize on a fewer number of hydraulic pumps, hydraulic controls, tubes and fittings. If it is not possible to have a smaller number of pumps and controls, then make those that are necessary interchangeable so that it will be possible to stock fewer parts for maintenance.
2. Standardize on types and sizes of electrical controls and make them interchangeable. Limit switches are particularly bad.
3. Standardize on the color and location of start and stop buttons. Starter buttons to be placed above or to the left of stop buttons.
4. Standardize grinding wheel hole sizes. A recent investigation in our plants indicates that not over eleven hole sizes will take care of well over 90 percent of our operations. At the present time over 100 hole sizes are used by grinding machine manufacturers. In several plants two or more grinding machines of different manufacture are used on the same operation on the same piece. The outside diameter and thickness of the wheels are identical and the grade and grain are the same, but the hole sizes are different. As an example, the manufacturers of floor type wet tool grinders standardized some time ago on 20-in. diameter by 2-in. wide wheels but they use four different hole sizes. Cutter grinders are probably among the worst offenders in this respect today.
5. Standardize size of turret lathe turrets, width across the flats, size of bores for toolholders, center distance between tapped holes in turret faces.
6. Standardize drill press spindle noses and multiple-spindle head spindles.
7. Standardize on the bearings used in multiple-spindle heads.
8. Standardize on motor mountings.
9. Standardize on leveling blocks for machine tools and on the surfaces used for leveling or better still provide a means for leveling built into the machine.
10. Standardize on operating controls so that controls operate in the same direction as the travel of the unit controlled.
11. Standardize and reduce the number of different sizes and types of screws, nuts and bolts used in machine tools. It has now reached the point where a machine repair man must use a truck to carry the different tools required to work on the various machine tools.
12. Standardize on the distance from the top of the carriage to the center line of the spindles on lathes of the same swing.
13. Standardize on the tapers used in headstocks and tailstocks of lathes and grinders.
14. Standardize on air chuck and air cylinder mountings—at the present time it is usually necessary to replace these items with others of identical manufacture.
15. Discontinue the use as much as possible of special anti-friction bearings in machine tools.
16. Standardize on model designations. Stop the use of numbers that mean nothing to our process people and the men in the shop. Engine lathes and external cylindrical grinders are designated by the swing and length of work they will accommodate, but turret lathes and internal grinders have model numbers that do not mean anything but confusion in the minds of people who must use them. Have any of the machine tool people ever tried to figure out which of the models of turret lathes manufactured by the half dozen companies making such machines are interchangeable? Why not stop the use of model numbers such as now used and designate them by the diameter they will swing and the distance from spindle nose to turret? Why not designate internal grinders and boring machines by diameter of work they will swing and the length of stroke? Why not designate gear hobbers, shapers and grinders, by the diameter and width of gears they will machine? In the case of milling machines we have *H, J, K, L, M* and some other letters attached to the model numbers.
17. Standardize on a single uniform size dimension sheet for use in quotations so the user does not have to hunt through a catalog to find the data on the particular machine covered by the quotation.

Unless machine tool builders step up to this standardization problem they will be faced again with a variety of standards set up by the industry. There has been some discussion regarding the setting up of a General Motors Standard to cover several of these items. It should not be necessary for us to do this, the machine tool builders should have been way ahead of us.

Question 2—*How far should machine tool builders go in the way of increased feeds and speeds and heavier, more powerful machines?*

Even though we are not yet too familiar with the results that will be obtained from the new cutting techniques we do know that in several cases we are running machine tools to their capacity. Machine tool builders should design any new machines to have spindle speeds, table feeds and power enough to take care of the new developments in cutting tools. Spindles, particularly on milling machines, should have built-in flywheels, gear train vibration must be eliminated, and machines should be furnished with speed and feed ranges to cover the lowest and highest. It should not be necessary to purchase a low-speed, a medium-speed or a high-speed machine, but machines in which all ranges are included when originally purchased.

Question 3—*Will the preference in the future be for hydraulic or mechanical feeds?*

Generally speaking, where a constant feed is used, mechanical feeds are preferred and where variable feed is required, hydraulic. Practically everybody brought out the serious maintenance problem with hydraulics due to inaccessibility and complicated circuits which result in high maintenance costs. The trend today is away from hydraulics due to maintenance costs, and unless the machine tool builders do something about getting hydraulic units, controls and piping out in the open this trend will become more pronounced. The maintenance of hydraulic equipment on machine tools today is definitely one of our worst problems.

Question 4—*Will the preference be for full electric controls?*

The answer is "yes" providing that wiring and controls are dependable and accessible and protected against damage, dirt, oil and coolant. The thing to watch here is that we don't get into the same trouble that we are now having with hydraulics.

Question 5—*Is the present emergency finish on machine tools satisfactory?*

The answer is "no," and we prefer to return to the prewar finish after the war. The machine tool builders should, however, attempt to get better castings so as to eliminate the use of filler. As for color, the trend is likely to be to even a lighter color than the prewar machine tool gray. Another point brought out in connection with this question was that the present painting of interior surfaces was generally not satisfactory. There has been considerable difficulty in our plants with such paint flaking off and plugging up lubricating oil and hydraulic oil and coolant lines.

Question 6—*Will it be necessary for postwar machine tools to produce better finishes and more accurate work?*

The opinion here was that generally speaking present machine tools are satisfactory in this respect but that when we remove stock faster it will no doubt require more rigid machines with more power to maintain present results.

Question 7—*Are present chip disposal arrangements on machine tools satisfactory?*

The answer here is very definitely *"no."* This problem is particularly serious since even under present conditions the chip problem is bad on all types of machine tools—mills, drills, lathes and grinders. In fact grinders are often the worst offenders, and in many cases it has been necessary to add additional sumps to take care of the grinding sludge and to keep the coolant at a temperature which will not affect the accuracy of the work produced. Machine tool designers must certainly study this problem, since if conditions are bad at the present time they will certainly be much worse when we remove two to four times as much material in a given length of time than we do at present. This will probably mean more room between the ways of machines, mechanical means of separating chips from the coolant and conveying them to an accessible place for disposal and sufficient flow of coolant to wash the chips where they are supposed to go. It will also mean much better protection than at present of electrical and operating controls, such as feed operating plungers and trip dogs.

Question 8—*Are the present lubricating facilities provided on machine tools adequate?*

There has been considerable work done on this problem by machine tool builders, but it should be carried on until every bearing is automatically lubricated from a central sump. More attention should be paid to the use of accessible filters and piping of adequate size. The machine tool designer should strive to eliminate all individual lubricating fittings. It has been suggested that when it is necessary to use individual lubricating fittings that a chart similar to a car lubrication chart showing location of all fittings be furnished. Also fittings be painted a bright color so that they can be easily located.

Question 9—*Will hardened and ground ways be preferred?*

The answer here is of course "yes," although in some cases where hardened ways are used at present the maintenance problem has apparently been forgotten. When hardened and ground ways are used they should be so designed that they can be reground in the user's plant without the use of special equipment and without complete dismantling of the machine. In other words a removable way that can be resurfaced on a grinder is preferred.

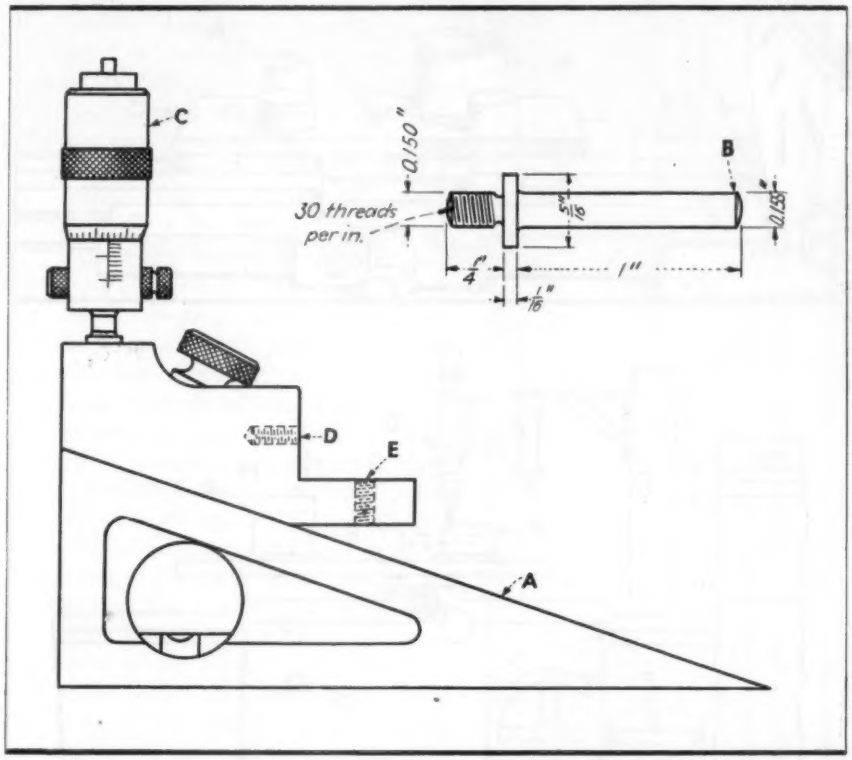
Question 10—*Will the preference be for electronic controls?*

The answer here is also "yes" providing they are of dependable construction and easily accessible for maintenance. It will be necessary to train maintenance personnel and machine tool builders and the manufacturers of electronic equipment must see that sufficient information is placed in the hands of the users so that the equipment can be serviced. It is also important that the manufacturers of electronic equipment get together and standardize on such items as: tube bases, control mountings, etc.; and machine tool builders should insist that this be done. We already have the problem of tubes of like characteristics, but different make, having different bases and are, therefore, not interchangeable.

Basically machine tools today do a good job on the operations for which they were designed but that is not the whole story. The operator of the machine represents our direct labor cost and that is a definite cost that can be pretty well controlled. On the other hand we have the cost of maintenance which, of course, goes into our overhead or burden and is, therefore, not thought of so much. If the maintenance cost was only the labor of the maintenance people it would be too high, but we must remember that often in the case of a machine breakdown we also must pay the operator for standing around producing nothing and often pay others who cannot operate their machines due to lack of stock from the machine which is down.

Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



An inside micrometer head adapted to a planer gage in any one of three positions shown here increases the usefulness of the gage

Micrometer Head Added to a Planer Gage

BY DANIEL E. McDONALD

By taking a conventional planer gage *A* and machining upright *B*, the conventional gage and inside micrometer head *C* can be combined to increase the usefulness of this tool. The combined gage can be set with greater accuracy and in shorter time than the planer gage taken alone.

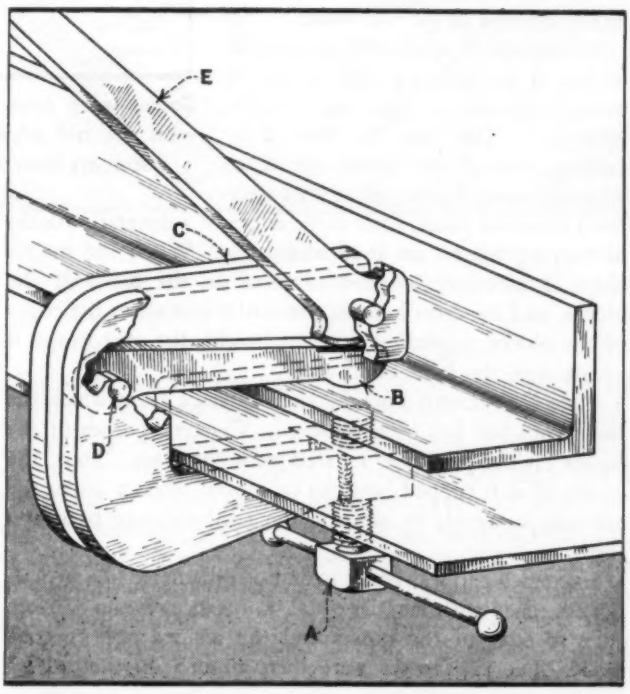
Upright *B* and micrometer head *C* can be attached to the planer gage in the position shown, as well as at locations *D* and *E*. Also, by the use of standard ½ in. collar, furnished with the inside micrometers, the full range of 1 in. can be obtained without resetting the planer gage.

Clamp Exerts 20 Tons Pressure

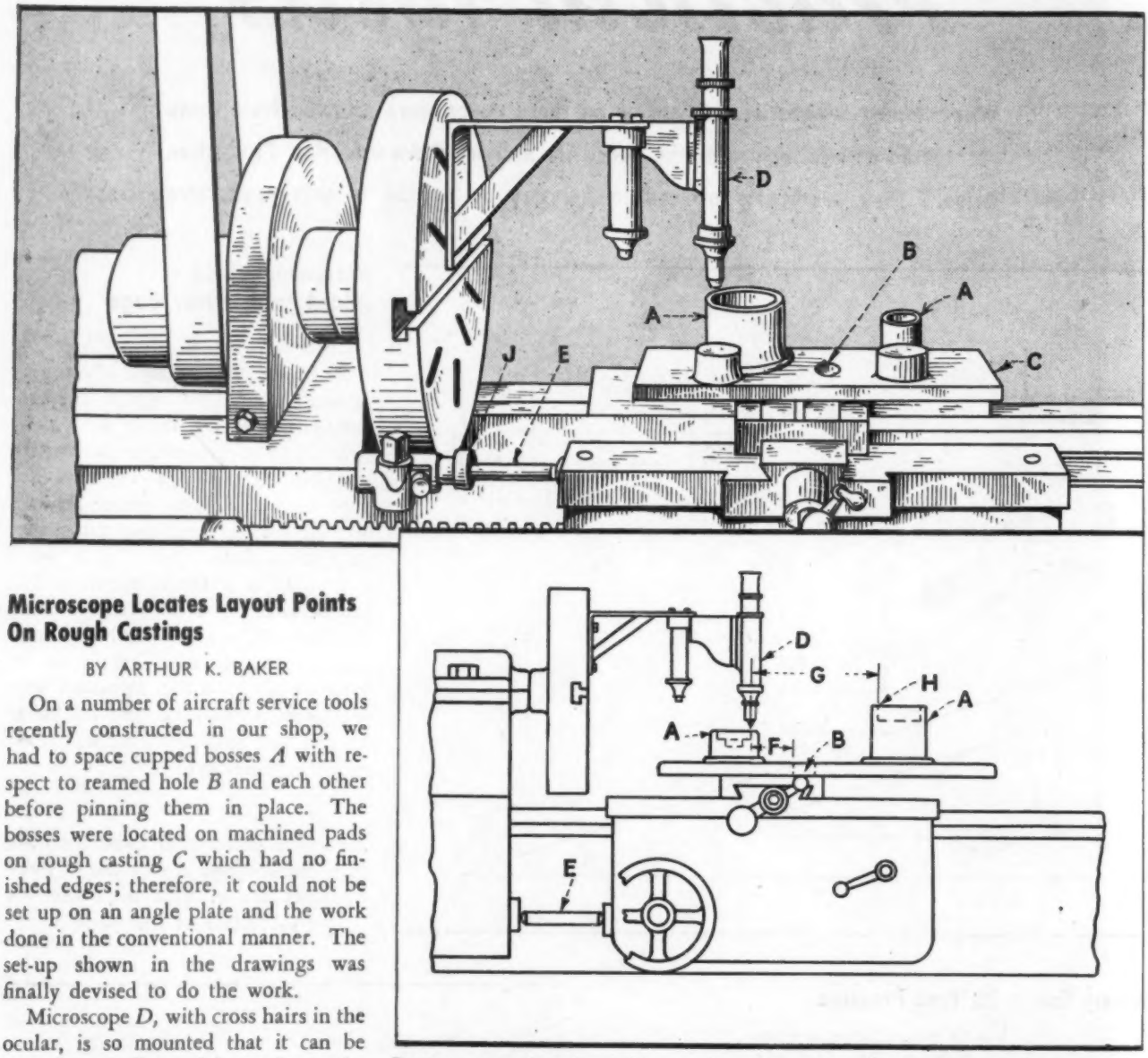
BY FRANCIS M. SHAW
Bethlehem Steel Company

The clamp shown in the drawing weighs 15 lb., has a cam action of ½ in., and is capable of exerting a pressure of 20 tons. Adjusting screw *A* is set to the desired distance between the plate to be clamped the face of cam *B*. The latter, fitted in yoke *C* and pivoted at *D*, is actuated by lever *E*. The bearing surfaces between the cam and the operating lever are hard-surfaced.

This clamp is useful where operations are repetitious, such as fitting doubler plates to structural members for tack welding; also, for use in restricted places where a C-clamp may be awkward to operate or satisfactory pressure cannot be applied. This cam-action clamp is particularly useful when fitting and welding operations are performed on a production basis. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



This cam-action clamp is particularly useful where fitting and welding of plates and structural members are performed on a production basis



Bosses were pinned on this rough casting after being positioned accurately with the aid of a microscope. Distances between the bosses were set by spacers inserted between the lathe carriage and a micrometer stop

Microscope Locates Layout Points On Rough Castings

BY ARTHUR K. BAKER

On a number of aircraft service tools recently constructed in our shop, we had to space cupped bosses *A* with respect to reamed hole *B* and each other before pinning them in place. The bosses were located on machined pads on rough casting *C* which had no finished edges; therefore, it could not be set up on an angle plate and the work done in the conventional manner. The set-up shown in the drawings was finally devised to do the work.

Microscope *D*, with cross hairs in the ocular, is so mounted that it can be moved vertically at right angles to the lathe bed. This may be checked by looking through the microscope at the edges of square blocks set against some fixed reference point, such as the edges of a dovetail. Blocks of varying height are used alternately. When the microscope is raised or lowered to focus on the edges of the blocks, and the cross hairs in the ocular just slices the edges of the blocks, regardless of their height, the microscope is square with the lathe bed.

Plate *C* is mounted on the lathe carriage from which the compound rest has been removed. The center lines of the bosses on the plate are squared with the ways. Thus, the center of each cupped boss can be moved directly under the microscope merely by shifting the lathe carriage back and forth.

Since each cup was bored to an exact diameter, spacer rods *E* were made with lengths equal to distances *F* and *G* from edge to edge of the bosses and the reamed hole, respectively. The cup bosses were then aligned on the casting by using this special set-up in the following manner:

The near edge *H* of the right-hand cup was set directly under the microscope. When focused, the cross hair in the ocular must slice the reamed edge of the cup. Also, when adjusting the draw tube on the microscope, there must be no apparent motion (parallax) of the cross hair with respect to the edge of the cup when moving the eye back and forth across the eyepiece of the instrument. Next, the micrometer stop *J* was set against the lathe carriage, clamping and adjusting it so as to make firm contact with the carriage. When the cross hair in the ocular sliced the edges of reamed hole *B* and the left-hand boss, after proper spacers *E* had been inserted between the micrometer stop and the lathe carriage, the two bosses had been correctly located and were pinned in place. A final check was then made in a similar manner.

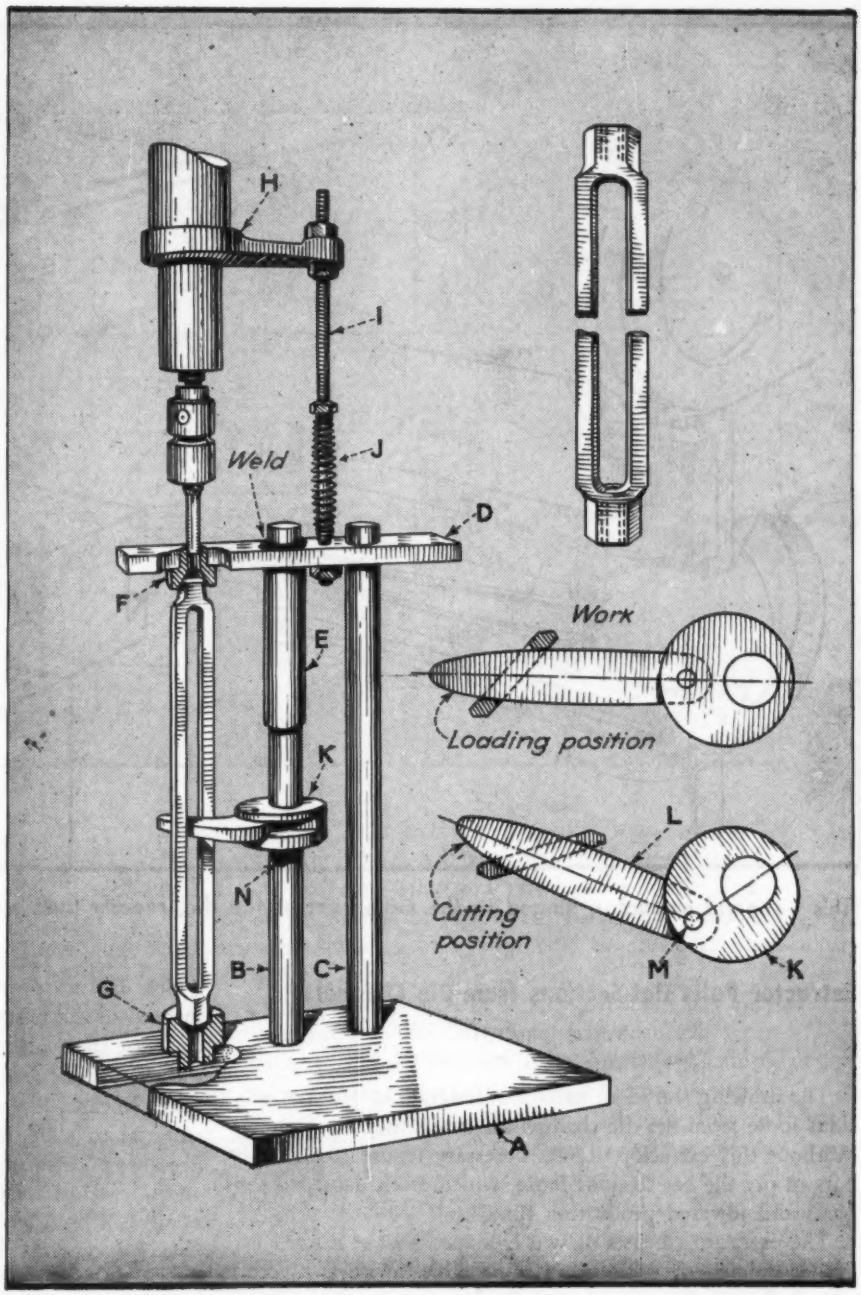
Drilling Fixture Has Equalizing Stop

BY D. BAKER

The fixture shown in the drawing was designed to speed the drilling and tapping of forged turnbuckle bodies. It has base *A*, two upright and parallel steel bars *B* and *C*, and plate *D* press-fitted with guide bushing *E*. This bushing is a slip fit on rod *B* and a loose fit on rod *C*. Cupped center bushing *F* is pressed in plate *D* and reamed for a slip fit of a drill bushing (not shown). The drill bushing is removed when the work is being tapped. Cup bushing *G* is mounted in base *A* directly in line with cup bushing *F*. Arm *H* is attached to the quill of the drill press which usually carries the stop screw. In this case, the screw has been removed, and in its place has been substituted bolt *I*. This passes through bushing plate *D*, with nut and spring *J* added as shown.

In operation, the workpiece is placed in position between the cupped centers and once the spindle is lowered, it is centered accurately and held firmly by action of spring *J*. After drilling and tapping, the spindle is raised and bolt *I* lifts bushing plate *D* to permit removal of the work.

The workpiece is kept from turning by equalizing stop *K*. This consists of a collar carrying swinging arm *L* which pivots on pin *M*. The collar is a free fit on rod *B*, but is held from dropping down by pin *N* driven through the upright rod. As the workpiece turns under pressure from the drill or tap, first one side and then the other will strike arm *L*. Since collar *K* is free to rotate about upright *B*, lever *L* adjusts itself so there is uniform pressure on both sides of the workpiece, something that could not be accomplished with a single fixed stop.



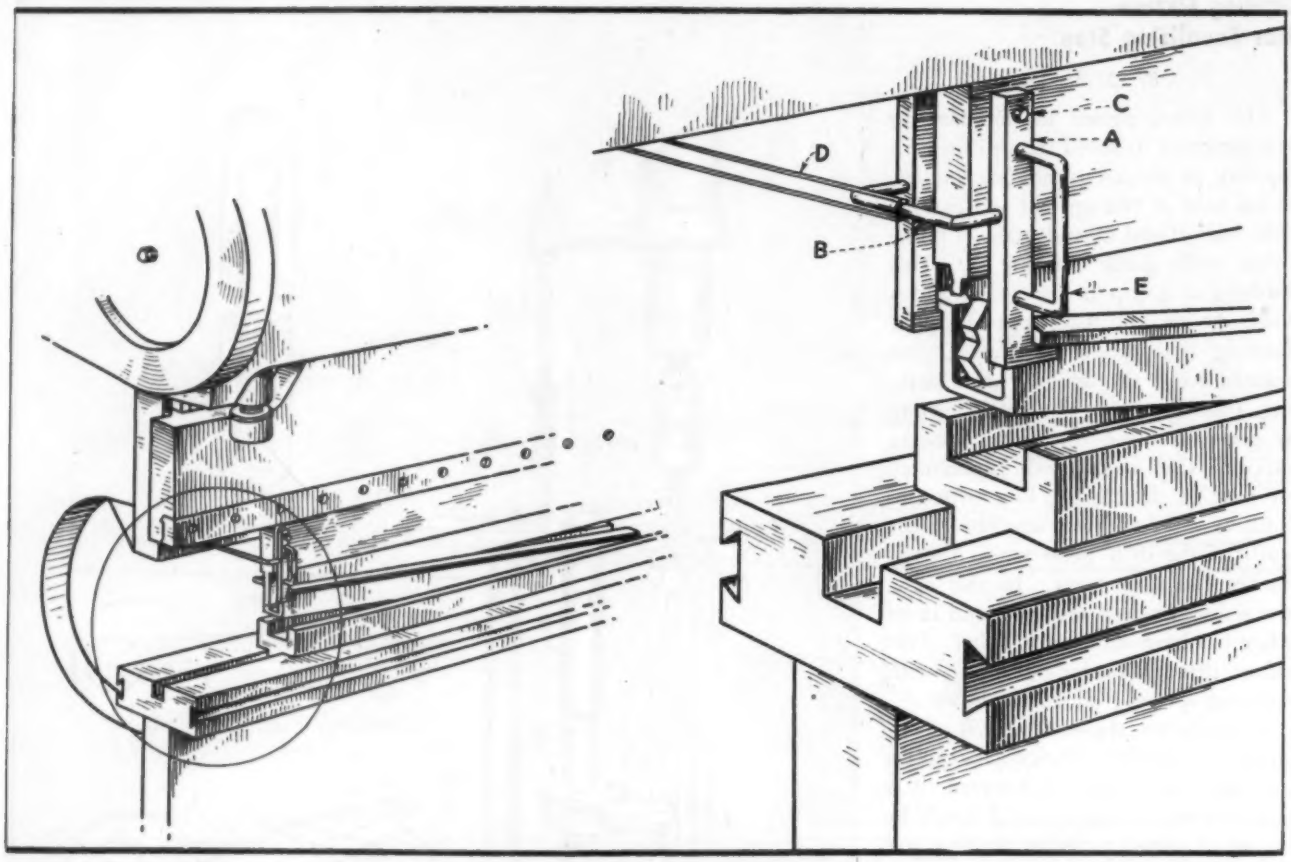
Forged turnbuckle bodies are drilled and tapped in this fixture, which has cupped centers for aligning the work, and an equalizing stop to maintain alignment of the part

Short Shells Cut from Large Tubing

BY A. JOHN

We recently received an order for a large number of short tubular shells to be machine finished at each end. The outside diameter was much larger than the through spindle hole on any of our lathes; consequently, the accepted method of feeding out and cutting off could not be applied. Sawing in a power saw and facing in a lathe was not desirable, because of the time required. Therefore, the reverse of standard practice was adopted.

The tailstock was removed from a production lathe and two steadyrests substituted. The tubing was centrally located upon the steadyrests and fed backward into the chuck. A parting tool was located in such relation to the chuck as to produce the exact length. In operation, the piece was held in the chuck and the full length revolved until final parting. No jamming or large burrs occurred, the tool going almost through the tube before the driving torque finally twisted the pieces apart. Results were highly satisfactory. Naturally, the tube had to be fed against the chuck stop by hand, although for long runs a feeding device could have been designed.



This L-shaped extractor, hinged to the male part of the die, readily pulls hat-sections from the die after forming

Extractor Pulls Hat-Sections from Die Channels

BY M. T. PATCH
Northrop Aircraft, Incorporated

The drawing shows an extractor designed to pull hat sections loose from the die channel on which they are formed. Without this extractor, it was necessary to use steel pinch bars to pry the hat sections loose, which often damaged the parts and lowered production time.

The extractor consists of two L-shaped bars *A* hinged together by curved connecting bar *B*. This device is pivoted at bolt *C* from the male part of the forming die, and is held free of the work by heavy rubber band *D*. Handle *E* facilitates setting the extractor to the work.

When a hat section is ready for removal from the die channel, the operator engages the L-shaped ends of the extractor with the hat-section flanges. The brake is opened, and the material is pulled free. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Prevents Scatching of Sheared Aluminum Sheet

BY ROBERT H. WHITE
Douglas Aircraft Company, Incorporated

Micarta phenolic sheet placed on shear table tops prevents scratching of aluminum sheet stock being cut to shape and size for aircraft subassemblies. Previously, paper was used, which did not prove satisfactory. The Micarta sheet is cemented to the table and holds the material high enough to clear the shear blades. Handling is easy compared to sliding the sheet stock on paper covering or on the table itself, because Micarta has a smooth glassy finish which allows the material to slide freely. This practice has eliminated the need for burnishing and recutting scratched aluminum sheets, with an estimated saving of 5,616 man-hours annually. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Drill Jig Fitted With Screw Jack

BY ALEX GEORGE

The drill jig shown in Fig. 1 is used where there are holes to be drilled halfway through part shown in Fig. 2. The jig consists of a base, two end spacers, a cover, a screwjack, and three standard drill bushings.

Base *A* is made to accommodate the thread on screwjack *B*, and to hold spacers *C* which are held by screws and dowels *D*. Cover *E* is fastened by the same means and has two reliefs *F* cut into the sides to allow the operator to reach the handles on the jack conveniently. Spacers *C* form the sides of the jig between the cover and the base, the space between these two parts being made to suit the height of the jack.

The jack clamps and locates the work in the jig, and is

raised into position by turning handles *G* until the work, which is located in recess *H*, reaches the underside of cover *E* and is locked in position. The four handles make it convenient to turn the jack when it is in any location, because one handle is always accessible. The handles, turned down at the ends, are press fitted into the head of the jack.

The three standard drill bushings are made to the size of hole to be drilled in the work, and are press fitted into cover *E*. It will be noted that there is clearance at *J*. This permits chips to escape and prevents them from marring the work. Relief *H* assures an even surface for the work and gives some clearance for the screwjack when loading the jig.

Parts to be drilled in this jig are held securely by a screwjack. The jig is particularly useful when drilling holes halfway through thin parts

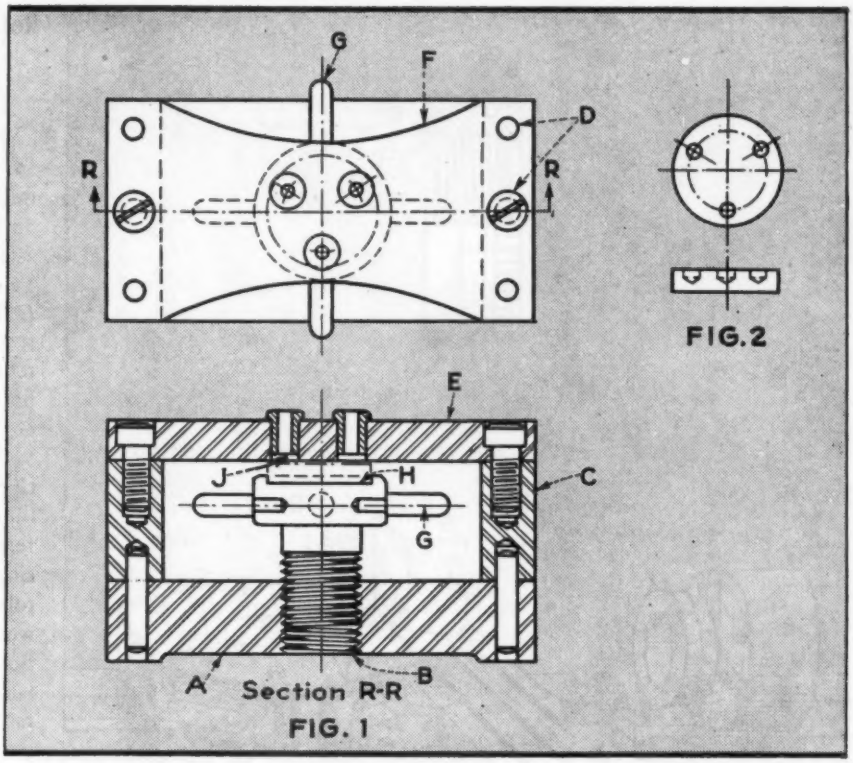


FIG. 1

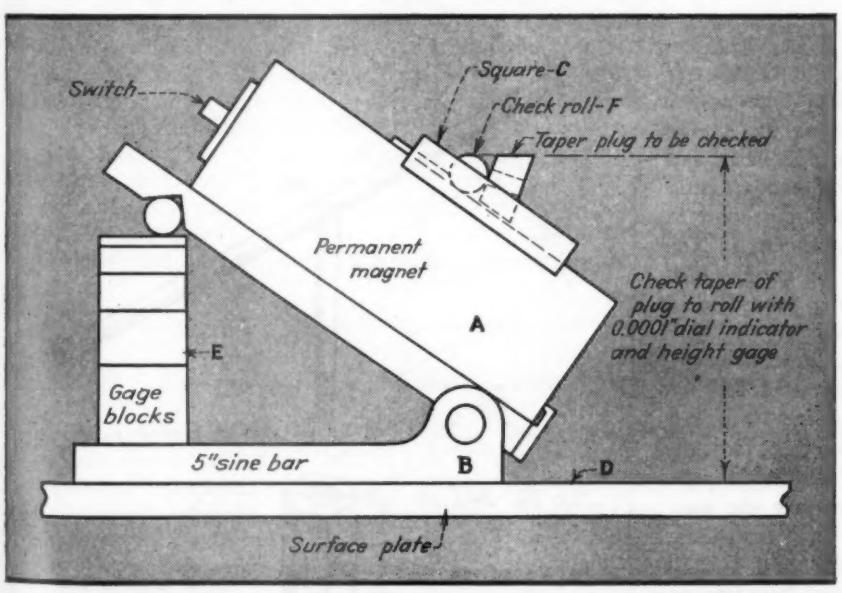
FIG. 2

Taper Plug Gages Checked With Sine Bar

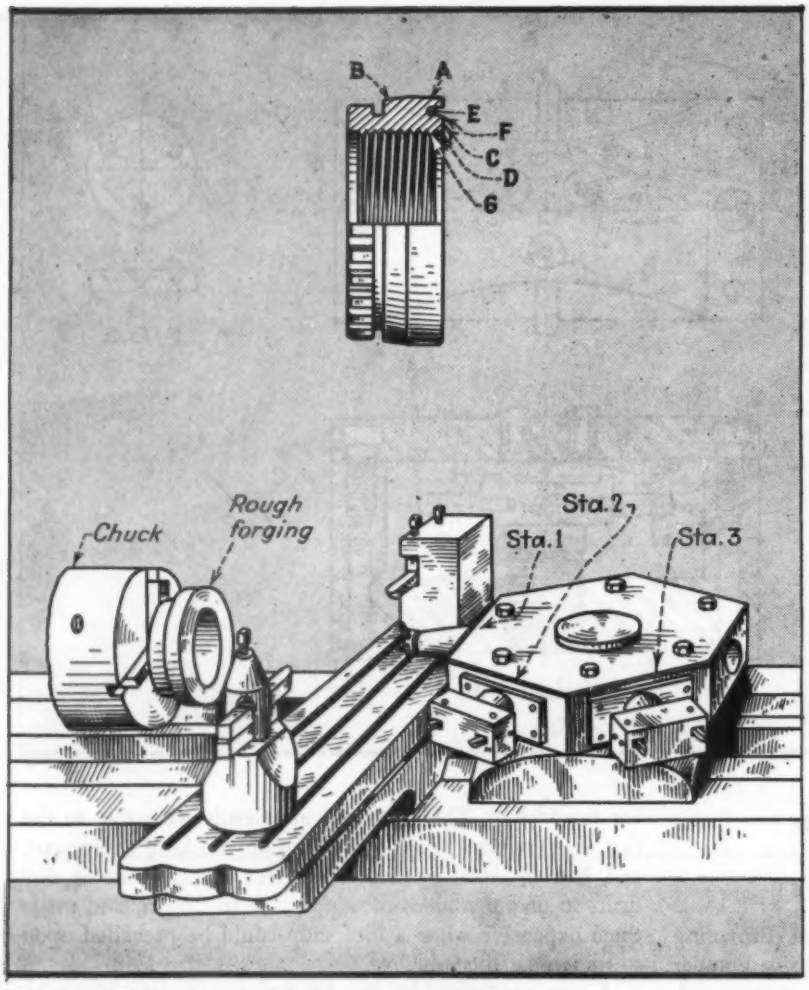
BY FRED A. HOWLAND
Savage Arms Corporation

In order to machine the chamber of a 50-cal. Browning aircraft machine gun within the required limits, a number of gages with a maximum tolerance of 0.0001 in. are used. At final inspection, the completed operation is checked with a set of 17 plug and tapered gages. When purchasing these gages, it was necessary to return them three or four times for reworking. The rejections apparently were due to the fact that few tool shops had precision checking equipment, and had to work by trial and error. This made it difficult to obtain sources of supply for the gages, and made them expensive when a tool shop could be prevailed upon to undertake the job.

A new application of an old checking method has eliminated this difficulty. The only equipment required is permanent magnet *A*, 5-in. sine bar *B*, toolmaker's square *C*, surface plate *D*, gage blocks *E*, a height gage or surface gage, a 0.0001-in. dial indicator, and check roll *F* lapped to a dimension determined by trigonometry for the particular gage to be checked. With the magnetic block on the sine bar set to the sine of the required angle, the check roll is squared to the side of block *A*. The small flat side of the tapered gage, which is to be checked, is then pressed to the edge of the check roll and the magnet is energized. The dial indicator is then set to the check roll and the tapered plug gage. If the indicator reading is the same at the maximum and minimum diameters as the roll, the gage is correct to within 0.00005 in. Since this check method was suggested, only three gages in one hundred sets received were rejected, and we have no trouble in securing contractors. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Chamber gages for 50-cal. Browning machine guns are checked quickly with this sine bar set-up, determining the accuracy within 0.0001 in.



The operations on this propeller shaft nut formerly required 11 tools and two turret lathes. A single lathe was retooled to perform all operations

Retooling Saves 6,240 Man-Hours

BY E. F. SLADOWSKI
Packard Motor Car Company

The drawing shows the tooling set-up for machining the front bearing retaining nut for the reduction-gear propeller shaft on an aircraft engine. These operations are as follows: Turn outside diameter *A*, turn 15-deg. taper *B*, face side *C*, turn undercut *D*, recess groove *E*, and turn 45-deg. chamfers *F* and *G*. These operations formerly required separate tools for roughing and finishing, except for machining *B*, *F* and *G*—a total of 11 tools.

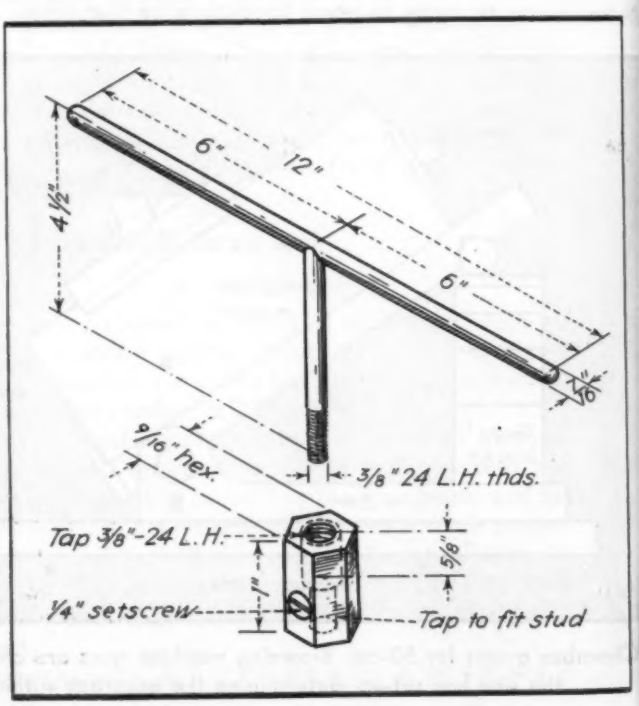
In retooling this job, cemented-carbide tipped tools eliminated the use of four high-speed steel roughing tools. Then the remaining seven tools were set up on a single turret lathe as shown in the drawing, releasing the second machine for other work, and eliminating tooling at three positions on the hexagon turret of the first lathe. Furthermore, a square indexing turret on the cross-slide was replaced by the two toolposts shown. The retaining nut is now machined as follows: The tool in the rear toolpost turns diameters *A* and *B*. The tool in the front toolpost faces side *C*. The tool at station 1 undercuts bore *D*. The two tools at station 2 recess groove *E*. The two tools at station 3 cut chamfers *F* and *G*. Estimated annual savings is 6,240 man-hours. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Stud Puller for Close Quarters

BY P. SAINT ERNE

The studs in the exhaust port of a Wright G-102 cylinder are close to the fins, and after break-in runs a stud will occasionally be broken when dissembling the engine for inspection. These studs are subject to great heat, and are difficult to remove. On one occasion, a standard stud puller was used, and when it broke, the engine had to be torn down to remove the extractor and the stud. The extractor shown in the drawing was then designed, which eliminated trouble of this kind, and having proved satisfactory is used on other close-quarter jobs.

As a rule, at least 3/8 in. of a broken stud will remain, on which a 3/16 in. flat is filed. The illustrated stud extractor is then screwed onto the stud, and the 1/4-in. setscrew tightened. The handle is then screwed into the extractor until it bottoms on the stud. Continued pressure applied to the handle will readily remove the stud.



The setscrew in this stud extractor is tightened against a flat filed on a broken stud. Continued pressure on the handle after it bottoms on the stud will readily remove the broken part

Working With QUENCHING FLUIDS

QUENCHING is the rapid cooling of metal from above its critical temperature by immersion in liquids or gases, or by contact with metal. Its major application is to steel, which is the most widely used metal effectively hardened by a quench alone. The object of heat-treatment is to improve metal for industrial service by imparting to it certain desired physical properties, such as increased strength and greater wear resistance.

Steel can be hardened through heat-treatment because it is capable of existing in more than one internal form without losing its chemical identity, each form having different physical properties. Therefore, a brief review of the various phases or structural changes in steels during heat-treatment is essential to a study of quenching fluids used in the hardening of the steel.

Solid untreated steel is made up primarily of one or more of the following three structural forms: ferrite, cementite and austenite. Steel containing either ferrite, or both ferrite and cementite, when heated above its transformation temperature becomes austenitic, which transforms on cooling to give a fine-grain product varying in hardness and other properties according to the composition of the steel and the rate of cooling.

Martensite, the principal structure in fully-hardened carbon steels, is formed by rapid cooling to below 450 F.

Troostite is formed when martensite is tempered by reheating between 400 and 750 F. It is a softer and more ductile structure than the martensite.

Sorbite is formed when martensite is heated between 750 and 1,100 F. Such tempering produces a structure that is softer and more ductile than troostite.

Pearlite is formed when steel in the austenitic condition is cooled slowly. It is soft and ductile, and in this condition the steel can be machined readily. A combination of fine pearlite and martensite results when the steel is cooled at an intermediate rate.

Spheroidite is formed when the steel is cooled at an exceedingly slow rate from the austenitic condition. It may also be produced by tempering martensite, or the temper structure of martensite, that is, troostite and sorbite, at 1,200-1,300 F. Prolonged heating of pearlite or a combination of fine pearlite and martensite at 1,000-1,300 F. also produces spheroidite. This structure is softer and more ductile than pearlite, but in general is not as freely machinable.

The transformation rate curves or so-called S-curves in Fig. 1 indicate what takes place when steel is cooled from the austenitic condition.

Curve *B* shows a very slow rate of cooling, as in annealing. Transformation to pearlite begins at B_1 and is complete at B_2.

A more rapid rate of cooling, as in air cooling or normalizing, is indicated by curve *C*. The pearlite form is finer and harder than that produced by annealing, indicated by curve *B*.

When a piece of steel is cooled rapidly by quenching as represented by curve *G*, pearlite fails to form. Transformation takes place at temperature G_3 and martensite alone is produced.

Steel cooled at intermediate rates, as indicated by curves *E* and *D*, have a resultant structure that is a mixture of pearlite and martensite. The time at the high temperatures E_1 and D_1 is not sufficient to allow the transformation to pearlite to be completed, and the steel with its partially pearlitic structure cools to a low temperature where the remaining austenite transforms to martensite, as at points E_3 and D_3.

The cooling rate which just causes the steel to harden fully to martensite is known as the "critical cooling rate." It is indicated by the cooling curve which just misses nose *N* of the S-curve. There is, of course, a transformation rate curve or S-curve for each steel, its shape and position on the graph depending upon the chemical properties of the steel.

Alloying elements such as man-

This special section was made possible through information obtained from the following sources:

American Society for Metals
Atlantic Refining Company
Carnegie-Illinois Steel Corporation
Carpenter Steel Company
Cities Service Oil Company
Crucible Steel Company of America
The Esso Marketers
Fiske Bros. Refining Company
Gulf Oil Company
E. F. Houghton & Company
Pure Oil Company
Republic Steel Corporation
Rodman Chemical Company
Shell Petroleum Corporation
Socony-Vacuum Oil Company
Standard Oil Company of Indiana
D. A. Stuart Oil Company, Limited
Sun Oil Company
Swan-Finch Oil Corporation
Texas Company
Tide Water Associated Oil Company

ganese, nickel, chromium, molybdenum and vanadium retard austenitic decomposition and tend to shift the S-curve to the right on the time axis. Obviously, critical cooling rate curve *G* also moves to the right, indicating a slower permissible cooling rate, and permitting alloy steels, at a given cooling rate, to be hardened throughout heavier sections than carbon steels.

TEMPERING

The highly stressed condition produced by quenching is practically always relieved to some extent by a tempering or drawing operation conducted as soon as possible after quenching. This is a reheating to a temperature below the lower critical temperature of the steel. At a very low temperature such as 300 F., the martensite is not affected, and reheating principally relieves stresses and breaks down any austenite produced by the quench to martensite.

As the temperature is increased, say from 425 to 750 F., the martensite is gradually replaced by the softer transition constitutent troostite. Above 750 F. sorbite forms rapidly, all of these changes being accompanied by a gradual softening of the steel.

The tempering operation can be carried out in many ways, depending upon the temperatures involved. Salt baths, oil, molten lead, and air circulated by fans in special furnaces are used. Control of temperature is the most important factor when tempering if a close control of final hardness is desired. Cooling from the tempering temperature should be such as not to introduce stresses, that is, parts should not be quenched, although this is necessary on some types of steels to prevent a condition known as "temper brittleness," which would occur if the parts were cooled slowly.

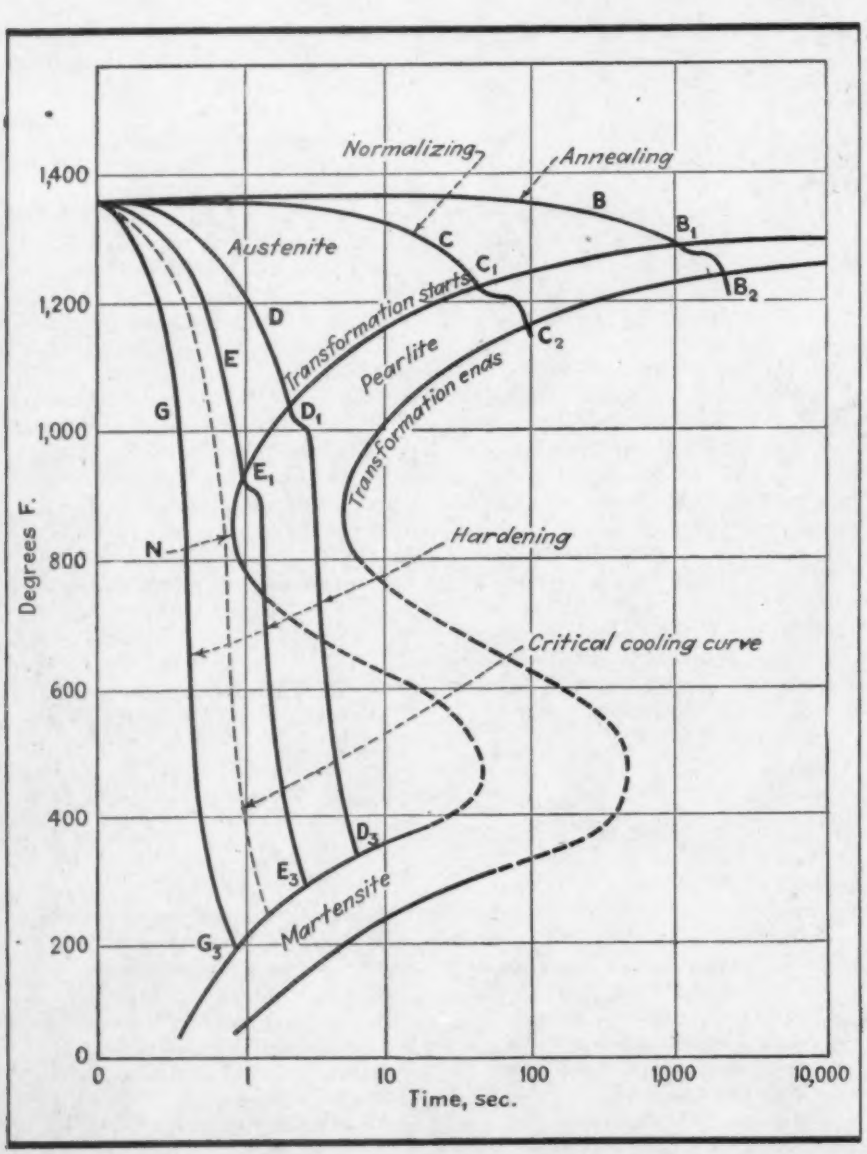


Fig. 1—Time-temperature-transformation curves indicate critical cooling rates for hardening steels to the fully martensitic condition

HEAT REMOVAL DURING QUENCHING

The cooling curve of metals during quenching, as shown in Fig. 2, exhibits three characteristic stages. These stages, beginning at the instant of immersion, are called *A, B* and *C,* respectively.

In the *A* or so-called vapor-blanket stage, the high metal temperature vaporizes the quenching medium, so that a more or less complete vapor envelope surrounds the metal. This envelope acts as an insulator, and cooling takes place principally by radiation through the vapor film. This is objectionable, and is controlled by agitation of the bath, low quenching fluid temperatures, and the selection of a good quenching medium.

The *B* or so-called vapor-transport stage begins when the surface metal temperature has been somewhat reduced, and the continuous vapor film collapses. Violent boiling of the quenching fluid then occurs with heat being removed from the metal at a very rapid rate, largely as latent heat of vaporization. Water is more active than oil in this stage.

The *C* or liquid stage of cooling begins when the metal surface temperature is reduced to the boiling point or range of the quenching liquid. Below this point, boiling ceases and slow cooling takes place by conduction and convection.

The *A* or vapor-blanket stage is of most concern in water solutions. Cooling is slow in it and if it persists for more than a few seconds, soft spots will result. Therefore, the vapor stage must be suppressed or nearly so, by keeping aqueous quenching liquids cold, preferably under 70 F. The duration of the vapor-blanket stage can be reduced materially by adding salt to the water.

Once the vapor-blanket stage is passed or suppressed, stage *B* or vapor-transport cooling, in which water has its phenomenal cooling power, commences. Cooling power in this stage is not reduced materially by increase of bath temperature, but is reduced appreciably by salt additions.

Water and water solutions of inorganic salt have the highest initial quenching speed, but these are retained through the lower temperatures that lie in the range where distortion and cracking occur, so that the field of usefulness for water quenching is re-

stricted to simple shapes and shallow hardening steels.

When quenching in ordinary mineral oils, the duration of the *A* or vapor-blanket stage is longer than when quenching in water. The rate of cooling in the *B* state in oil is considerably slower than the corresponding stages in water, and the duration of the stage is less. There is a gradual transition into the *C* stage cooling, as contrasted to the comparably abrupt demarkation between the *B* and *C* stages in water quenching.

An ideal quenching fluid would be one with characteristics of water in the *A* stage of cooling, a combination of characteristics of water and mineral oils in the *B* stage of cooling, and the characteristics of mineral oil in the *C* stage. Some fast quenching oils have been developed during the past few years which possess characteristics approaching those of the ideal quenching medium.

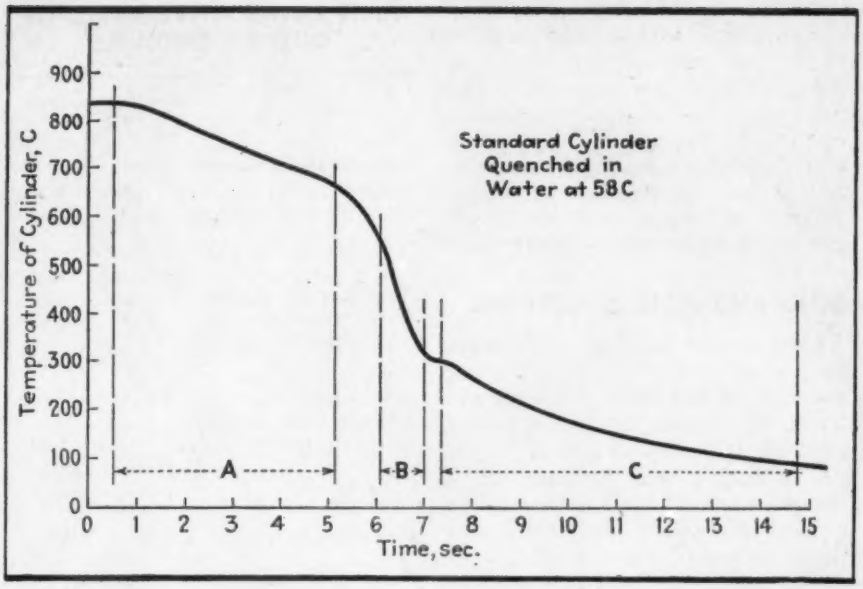


Fig. 2—These three stages occur when quenching hot steels. The first stage should be suppressed to prevent formation of soft spots

TYPES OF QUENCHING FLUIDS

A wide variety of quenching fluids is encountered in commercial heat-treating practice, but the five most generally employed types are:

1. Water in bath and spray.
2. Dilute sodium-hydroxide solutions.
3. Brines.
4. Oils.
5. Air.

These give a wide range of cooling rates and meet many of the requirements of industrial hardening in a satisfactory manner; however, problems often arise which make other quenching fluids attractive.

The first requirement of any quenching fluid is that it provides the desired cooling rate. However, the adaptabil- of any quenching fluid is dependent upon other factors, including:

1. Low cost and general availability.
2. Permanency with respect to its cooling characteristics in continued use.
3. Maintenance of cooling characteristics with moderate temperature changes.
4. Ease of handling.
5. Safety characteristics in regard to workmen and equipment.

Failure to meet one or more of these requirements will not necessarily preclude commercial use, but will influence final selection. Failure to provide the desired cooling rate automatically removes the cooling fluid from further consideration. Additional factors that affect the selection of the proper quenching medium are the method of quenching, the nature of the steel to be quenched, size and shape of the part to be hardened, and the physical characteristics desired in the hardened part.

WATER

Water is probably the most widely used quenching fluid, except air, and fully meets the requirements of low cost and general availability. It is easily handled and safe, but its cooling characteristics change radically with variations in bath temperatures. Therefore, a still bath of fresh water is not an ideal medium for quenching. Fresh water dissolves large quantities of gas from the atmosphere, and when a part is immersed in the bath, the boiling action throws this gas out of solution and it settles in the form of bubbles on the surface of the part, especially in holes or recesses. Non-uniform hardening results, evidenced by soft spots on the surface of the metal, and internal strains that are likely to crack or badly weaken the parts being hardened.

When provision is made for circulating water vigorously, for flush quenching, or for maintaining the water bath at constant temperature, fresh water may be considered entirely satisfactory as a quenching medium when other factors, such as type of steel, shape of the part and desired characteristics in the hardened part warrants its use.

Water baths at atmospheric temperatures provide cooling speeds somewhat below sodium-chloride brine, dilute sodium-hydroxide solutions and water sprays, but greatly in excess of those of oils.

SODIUM-HYDROXIDE SOLUTION

Dilute sodium-hydroxide or caustic soda solutions are used where quenching speeds in excess of those provided by water baths are desired. Their cooling characteristics can be maintained without unusually close control of concentrations, and they are better able than water to compensate for deficiencies in circulation. Their cooling rates are less affected by temperature rise than those of water, and their vigorous action upon heated steels effectively removes scale and so tends to prevent soft spots, thereby promoting uniform hardness. Rapid cooling is maintained to temperatures lower than those obtainable with water.

Caustic soda solutions are corrosive; therefore, they are not as easy to handle as other rapid quenching fluids. Their cooling characteristics also change with time, due to the absorption of carbon dioxide from the air; however, this can be avoided by mak-

ing up fresh solutions weekly. Although caustic soda solutions are the fastest and most efficient quenching baths available, they are seldom used because of their corrosive action on equipment, skin and clothing. Caustic soda solutions usually contain from 2.5 to 16.5 percent of sodium-hydroxide by weight, with 5 percent solution being the most generally used.

ACID AND ACID SOLUTIONS

Concentrated sulphuric acid without motion at 68 F. has a cooling rate intermediate between that of oils and water. A solution 10 to 20 percent sulphuric acid in water at 68 F., either still or in motion at 1 ft. per sec. is somewhat more rapid as a cooling medium than water, but appreciably slower than sodium-hydroxide. Change in acid concentrations from 10 to 20 percent has negligible effect upon the cooling rate, the resultant center or surface hardness, and microstructure of the part, especially when the part is high-carbon steel.

A 10 percent hydrochloric acid solution provides about the same cooling rate as a 10 percent sulphuric acid solution, but as the concentration is increased, the cooling speeds in the hydrochloric acid solutions drop to lower values than those in sulphuric acid solutions.

The corrosive nature of acid solutions is a disadvantage and has restricted their commercial application. Solutions of high concentration will change in cooling characteristics after continued use, so that constant precautions must be taken to maintain the desired concentration. Failure to do so causes uncertain results.

Table 1 — SALT SOLUTIONS

Salinometer reading	Percent of salt	Lb. of salt per gal. solution	Degrees Baume
0	0.00	None	1.00
10	2.65	0.22	2.60
20	5.30 [A]	0.46	5.20
30	7.95 [A]	0.70	7.80
40	10.60 [A]	0.95	10.40
50	13.25	1.21	13.00
60	15.90	1.48	15.60
70	18.55	1.76	18.20
80	21.20	2.05	20.80
90	23.85	2.35	23.40
100	26.50 [B]	2.66	26.00

[A] Most satisfactory for brine baths.
[B] Saturated solution.
NOTES: Brine is a good coolant for quenching water-hardening steels in a still tank.
Hold brine baths between 70-100 the year round for best results.
Even though excessive amounts of salt in a solution decrease the amount of air which will dissolve in it, quenching action will be slower. A saturated solution quenches so slowly that a water-hardening steel will barely harden in it.

Table 2 — RELATIVE RATES OF QUENCH MEDIUMS

Quenching Medium	Relative Quenching rates: Still	At 3 ft. per sec.
Water	1.00	1.01
5 percent sodium chloride	1.12	1.14
10 percent sodium chloride	1.20	1.23
5 percent calcium chloride	1.06	...
10 percent calcium chloride	1.17	...
2½ percent sodium hydroxide	1.19	...
5 percent sodium hydroxide	1.17	1.20

	Still	Flash point, F.	Saybolt viscosity at 100 F.
Prepared oils [A]	0.35—0.45	365—375	110
Fast oils	0.50—0.65	350—375	110
Mineral oils:			
Transformer	0.17	311	75
Machine	0.22	405	250
Paraffin	0.29	327	...
Vegetable oils:			
Palm	0.15	435	220
Rapeseed	0.22	379	250
Castor	0.29	565	1500
Cottonseed	0.36	610	175
Olive	0.37	590	200
Lard oil	0.19	565	180—200
Fish Oil	0.31	400	130
Sperm oil	0.33	500	110
Neatsfoot Oil	0.33	500	230—270
Mixed Oils:			
Pale neutral	0.26	360	65
Heavy residuum	0.29	360	1200
Mixture of both	0.32—0.42	...	...

[A] Mineral oil containing 3.8 per cent fatty acid.

BRINES

Sodium chloride or calcium chloride dissolved in water prevents water from dissolving atmospheric gas. This is the sole and only reason for adding the salt. The brine "takes hold" and "wets" the part all over immediately, so that quenching proceeds uniformly. Brine throws scale better than fresh water, and yields cleaner parts. Rock salt can be dissolved in water up to 26 percent, which is called a saturated solution. Percentages of salt, and pounds of salt per gallon of solution, for a salt bath are given in Table 1. The greater the percentage of salt used, the less air it is able to dissolve, and the slower will be the quenching action. A saturated solution quenches so slowly that a water-hardening steel can scarcely be hardened in it. The most satisfactory brine bath will contain between 5 and 10 percent salt, and is the most desirable coolant available for quenching water-hardening tool steels in a still bath. The temperature of the brine bath should be between 70 and 100 F. the year around.

The cooling rate provided by calcium chloride brine, with concentrations between 5 and 20 percent by weight in water, are about the same as those for sodium-chloride brines. Although brines will corrode equipment, they are widely used industrially, and have many desirable characteristics mentioned for sodium-hydroxide solutions. Chief of these is the fact that cooling characteristics can be controlled without exceptionally close control over concentrations.

OILS

Oils produce less distortion and less residual stress in steel; therefore, they are well adapted to complicated shapes and steels difficult to harden without cracking. As a group, quenching oils are intermediate in cooling velocities between water at 100 F. and 190 F. However, they give slow rates of temperature change below 550 to 660 F. in contrast with rapid cooling in water. Relative cooling rates for different oils, as well as physical properties of the oils, are given in Table 2.

Organic animal oils are excellent for quenching when fresh, carrying steel through its critical temperature nearly twice as fast as the usual mineral quenching oils. However, their good characteristics change with age and service. High cost, offensive odor and thickening in service prevent their general use.

Straight mineral oils are in general use today where the character of the steel or the type of work permits the use of very slow quenching agents. Warming the oil bath decreases the viscosity and imparts mobility to the oil, permitting increased convection and faster heat-transfer; accordingly, the best quenching speeds are secured when the bath temperature ranges from 90 to 160 F.

The usual slow-speed mineral quenching oils cool steel at 1,500 F. about 30 percent as fast as cold water, while modern high-speed mineral quenching oils attain a rate of about 65 percent that of cold water. Each type of oil cools steel at 400 F. only about 10 percent as fast as cold water. Therefore, the fast oils will harden types and sections of steels which will not harden effectively in the slower oils; also, they avoid the dangers incident to final cooling in water. Fig. 3 shows the relative cooling rates of water, slow quenching oils and a fast quenching oil.

SPECIFICATIONS FOR QUENCHING OILS

The standard tests are important with regard to secondary requirements of quenching oils.

Low viscosity assures free draining of oil from the work and, therefore, low oil loss. Low pour test assures ample viscosity when cold.

A high flash and fire point assures a high boiling point and reduces the fire hazard which is increased by keeping the oil warm.

A low carbon residue suggests stability of properties with continued use and little sludging.

The steam emulsion number should be low to assure low water content, water being objectionable because of its vapor film forming tendency and high cooling power.

A low saponification number assures that the oil is of mineral base and not subject to organic deterioration of fatty oils, which gives rise to offensive odors.

The "5 sec. test" is frequently used for specifying quenching oils. The specimen used is a polished cylinder of stainless steel 1 in. in diameter and 2½ in long. After heating for 1 hr. at 1,500 F., the specimen is time-quenched without agitation for exactly 5 sec. in two quarts of oil at an initial temperature of 100 F. The oil is then agitated, and the increase in oil temperature produced by the 5 sec. quench is determined. The oil is cooled to 100 F., a second specimen is quenched with agitation until completely cooled, and the maximum temperature rise is noted. The initial quenching speed is then determined by the formula:

$$\frac{\text{Temp. rise in 5 sec.}}{\text{Temp. rise in total heat test}} \times 100 = \text{percent of heat removal in 5 sec.}$$

Initial quenching speed determined in this manner for water and a representative group of commercial quenching oils are given in Table 3.

Table 3 — FIVE-SECOND TESTS

Quenching Medium	Percent of heat removed in first 5 sec. of quench
Water	53.4
Oil with high initial cooling rate	36.9
Oil A (sample No. 1)	33.9
Oil A (sample No. 2)	26.2
Oil B	17.3
Oil C	19.9
Oil D	21.7
Oil E	30.8
Oil F	31.0
Oil G	20.4
Oil H	25.8
Oil I	19.3
Oil J	27.9
Oil K	15.6
Oil L	18.8

AIR

When the degree of distortion produced by oil quenching is objectionable, recourse is taken to air hardening. For still air quenching, it is best to suspend the part to be hardened; also, it can be placed on a screen so that the air can circulate freely past it. Accelerated air cooling can be induced by fans or compressed air; however, in the latter case extreme care should be exercised to remove all moisture from the compressed air lines.

HEATED SALT AND METAL BATHS

Liquid metals and salts are also used as quenching media. A cadmium-tin alloy at 355 F. has a cooling rate intermediate between oil and water in regard to hardening ability, and is much superior to oil in regard to residual stress generation. It has been possible to improve the toughness of hardened alloy steels at high hardnesses by quenching in molten lead-tin-bismuth-cadmium alloys at around 480 F.

Molten metal baths cool more rapidly than salt baths, but neither produce full hardness in carbon steel, except in very small sections. However, molten metal baths often give sufficiently rapid cooling to produce high hardnesses in low alloy tool steel. These media are rarely used except for high-speed steels. Their purpose is to permit a fairly rapid cooling down to the temperature of the hot bath, and then employ a slower rate down to room temperature. Tools so quenched must finally be cooled below 200 F., and then drawn as though quenched in a more normal fashion.

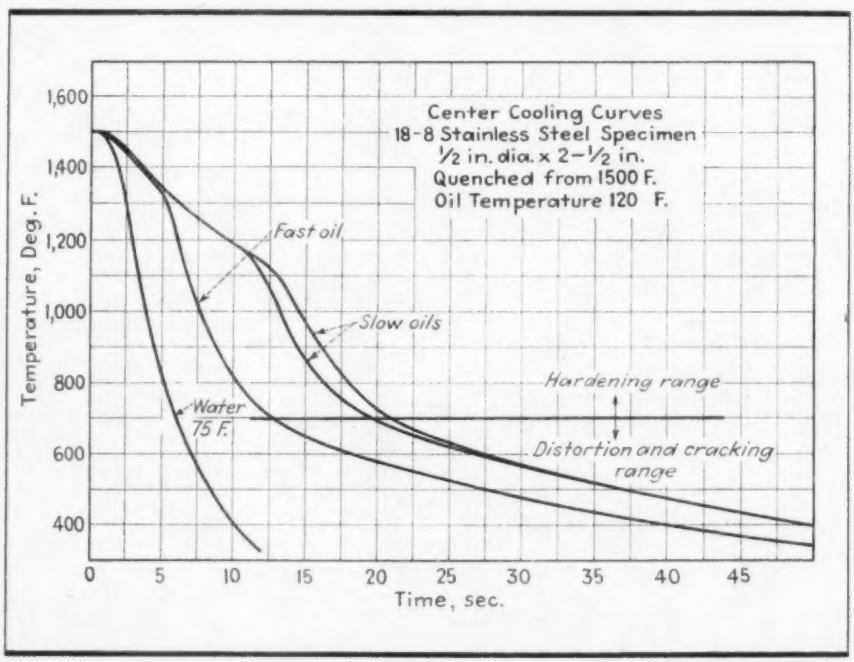


Fig. 3—Oils cool steel from 30 to 65 percent as fast as water at 1,500 F., and 10 percent as fast at 400 F. They cushion the quench at low temperatures and are well adapted to steels difficult to harden without cracking

OTHER QUENCHING MEDIUMS

A mixture of water and glycerine in any proportion will produce a rate of cooling intermediate between oil and water. For oil-hardening steels, the glycerine content should be between 60 and 90 percent. The cooling rate of this liquid is faster than oil in the final stages of quenching, which condition is objectionable because it sets up residual stresses of the part being hardened. The same objection applies to solution of ethylene glycol and sodium silicate in water.

Mercury can be used to obtain local hardening.

Emulsions of oils in water have also been used as quenching mediums, but these are generally unsatisfactory.

Soap solutions may lower cooling rates appreciably; however, vapor created at the surface of the steel immediately after immersion tends to produce non-uniform hardening.

Cooling rates for various mediums are illustrated in Fig. 4.

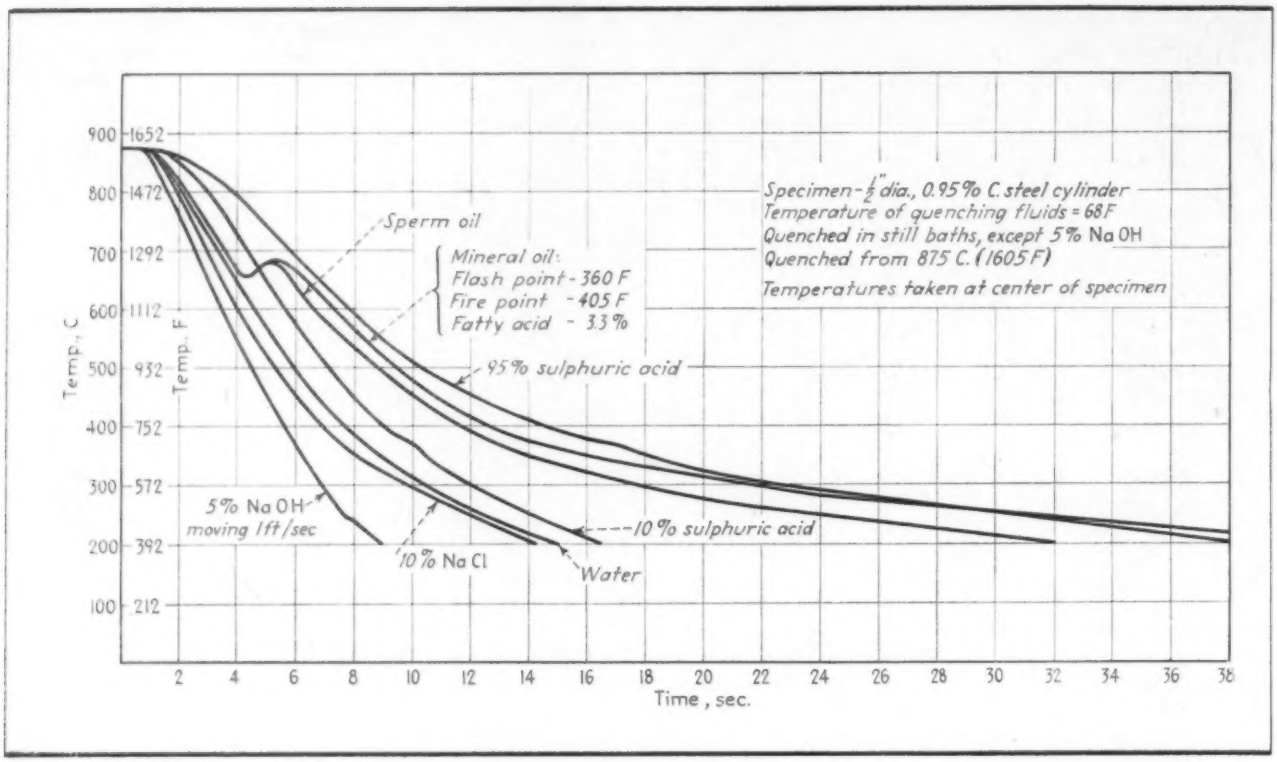

Specimen - ½" dia., 0.95% C. steel cylinder
Temperature of quenching fluids = 68 F
Quenched in still baths, except 5% Na OH
Quenched from 875 C. (1605 F)
Temperatures taken at center of specimen
Sperm oil
Mineral oil:
Flash point - 360 F
Fire point - 405 F
Fatty acid - 3.3%
95% sulphuric acid
10% sulphuric acid
5% Na OH moving 1 ft/sec
10% Na Cl
Water
Temp., C
Temp., F
900 1652
800 1472
700 1292
600 1112
500 932
400 752
300 572
200 392
100 212
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38
Time, sec.

Fig. 4—A wide range of cooling rates are obtainable with these quenching media, which meet most industrial hardening requirements. Corrosive effect of caustic soda and acids limit their commercial application

QUENCHING PRACTICE

Water provides the fastest cooling rate attainable in practice, and is properly applied to carbon and to low-alloy steels, commonly designated as shallow-hardening steels. Under ideal conditions, the cooling rate of water is fast enough to harden even heavy sections of plain carbon steels. However, complicated or unsymmetrical sections of these steels cannot be hardened without excessive distortion or danger of cracking, because of the drastic water quench required.

Plain carbon steels are oil quenched for full martensitic hardness only in very light sections, for example, in the case of knife blades. In larger sections only partial hardening can be expected. Oil quenching of plain carbon steels is sometimes used in the stress-relieving heat-treatment of severely cold-worked parts such as cold-headed bolts. Further, an oil quench may be used for improving the machinability of low-carbon steels.

Oil quenching is applied most commonly to moderately or highly alloyed steels to obtain full martensitic hardening with a minimum of distortion. The final cooling stage in an oil bath sets in at a considerably higher temperature than in the case of water, and the cooling power here is only about half that of water. Therefore, residual stresses which favor cracking and warping are of a lower degree in an oil quench.

Occasional cracking of certain tool steel parts which harden completely through may still occur in an oil quench. Here withdrawal of the hot work from the quench and final cooling in air is more easily accomplished at a given work temperature than in the case of water, because of the lower cooling rate involved. However, this expedient is not generally applicable where large differences in work thickness exist.

The use of a water quench rather than an oil quench is, in general, indicated for the following conditions:

1. Where the first cost of the quenching medium is of any importance, which is rarely the case.
2. Where irregular quenching due to temperature changes in the water is not important.
3. Where the steel demands the drastic quenching obtainable with cold water or salt solutions.
4. Where the steel can withstand the cracking and rupturing strains incident to rapid cooling at the lower temperatures.
5. Where mere hardness is of more importance than toughness and good structure.

The quenching speed of oil remains practically constant over a wide temperature change of the oil, whereas the quenching speed of water varies greatly with the temperature of the water. Cold water quenches steel at the critical temperature about four times as rapidly as the usual quenching oils, and about twice as rapidly as "fast" quenching oils. Hot water quenches steel at the critical temperature more rapidly or more slowly than oils, depending upon the exact temperature of the water. Either hot or cold water quenches steel at lower temperatures 10 to 20 times as rapidly as oils, and thereby causes cracking and rupture. The "fast" quenching oil carries steel through the critical temperature nearly twice as fast as the usual quenching oils, but softens the quenching speed at lower temperatures, thereby avoiding the danger of cracking and rupture.

QUANTITY OF QUENCHING FLUIDS REQUIRED

When oil is the quenching medium, the usual rate for quench tank capacity is 1 gal. of oil for each pound of steel quenched per hour. This capacity can be somewhat smaller where separate oil coolers or circulating pumps are used, but the use of this figure will avoid any difficulties with the control of oil temperature and will allow for intermittent quenching of steel, which increases the cooling requirement for short periods well above the average.

Because water-quenching temperatures should usually be lower than those for oils, it is a good plan to follow the same rule for determining the size of water tanks, in spite of the higher specific heat of water as compared with oil.

TEMPERATURE OF THE BATH

As a rule, increase in the temperature of the quenching fluid reduces the rate of cooling and reduces the hardness of the quenched steel. In water and brine, the change in cooling rate is small for temperature variations below 100 F. Near the boiling point, the cooling rate is low due to the formation of low conductivity vapor in contact with the quenched steel.

It is best that temperature of water quenching baths be kept below 70 F.

It is recommended that the temperature of quenching oils be kept between 90 and 160 F. The effect of oil-bath temperatures is particularly important where quench tanks are small, or where proper circulation of the oil is not provided.

Where quenching speeds between cold water and oil are desired, hot brine or hot sodium-hydroxide solutions are frequently used.

The effect of temperatures of quenching mediums are shown in Fig. 5.

SURFACE CONDITION OF QUENCHED PART

The surface condition of a part to be quenched exerts a dominant influence in determining success of hardening treatment, because during quenching all heat is removed by the fluids from the surface of the steel.

The degree of scaling which takes place during the heating prior to quenching may modify the results greatly. Scale hinders heat transfer from the metal to the quenching medium, and this leads to spotty and incomplete hardening. The effect is less pronounced in water quenching than in oil quenching, because the violence of steam formation is sufficient to throw the scale from the surface of the steel. The vapor formation in oil quenching does not always take place with the force necessary to remove the scale and the rate of heat extraction may be, in extreme cases, so greatly retarded that no appreciable hardening results. Such a condition is more likely to occur in the quenching of carbon steels, which have high critical cooling rates. Whatever the condition of the surface, in order to prevent non-uniform results, it is important that it be either uniformly scaled or free of scale. It is preferable for oil quenching to so regulate the heating condition that scaling be either prevented or kept at the irreducible minimum.

Smooth surfaces cool faster than rough surfaces, probably because gas bubbles do not stick to the smooth surfaces to the same extent as they do to the rough finishes.

AGITATION OF THE QUENCHING BATH

Agitation should be planned and applied to obtain a symmetrical action of the quenching fluid on all sides of the immersed work, because the rate of heat removal of all quenching fluids increases up to a certain point as the degree of agitation increases. This is particularly important to minimize warpage of relatively slender parts. In this respect, the brine quench has the advantage of more uniform action than can be secured by manual or mechanical agitation in fresh water baths. Agitation is particularly desirable for hardening the surfaces of parts.

Agitation, if severe enough, can effectively eliminate the vapor or steam jacket formed when hot steel is first immersed in water. Continued agitation supplies cooler fluid to the surface of the piece, and helps remove the gases released from or formed by the quenching fluid at the surface of the metal, and prevents local heating of the bath in the vicinity of the metal; consequently, it eliminates soft spots attendant with quenching in still water, and promotes uniform hardening. Agitation by properly located and immersed propeller-driven blades, or by direct pump-driven streams of the quenching media, are the preferred methods.

Effect of agitating quenching oils is shown in Fig. 6.

IMMERSION METHODS

When the selection of the quenching medium has been determined, consideration must be given to the size and shape of the quenching tank, and to appropriate facilities for circulating the quenching medium and returning it to the quenching tank.

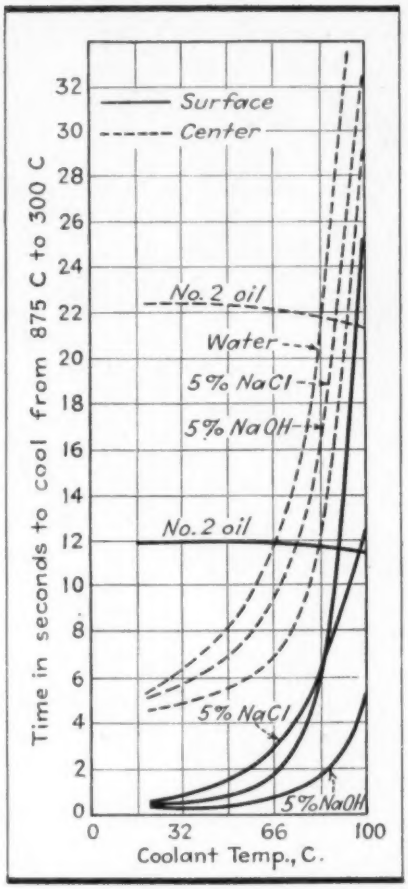


Fig. 5—Cooling rates for water, brine and caustic soda decrease rapidly with increase in bath temperature. Best temperature for water and brine is below 100 F., while those for oils are between 90 and 160 F.

Specific jobs will indicate which of the following methods will have to be used for introducing the part into the quenching media:

1. Hand quenching, where the piece is plunged into the bath.
2. Gravity quenching, where the piece falls freely through the bath.
3. Mechanical quenching, where the movement of the piece through the bath is controlled, as by mechanical conveyors.
4. Fixture or flush quenching, where the piece is clamped in a rigid fixture to minimize distortion.
5. Spray quenching, where the piece is flooded by air or liquids from nozzles at high velocity.

Whichever type is used, it is advisable to maintain the quenching medium within a relatively narrow temperature range. Otherwise, variations in results will occur.

Timing in the quench must be uniformly the same for all like sections. Otherwise, a variation will exist in the

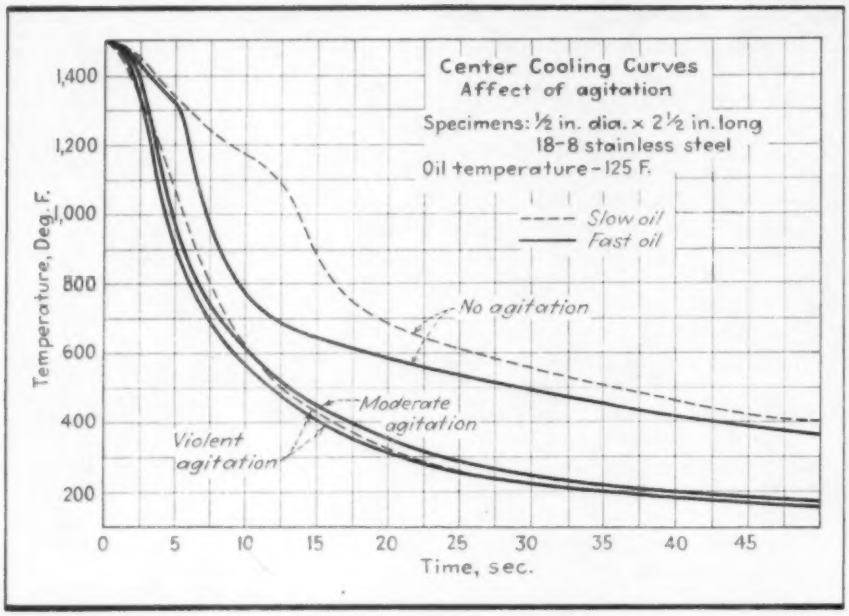


Fig. 6—Agitation of the bath increases the rate of heat removal from quenched parts. If severe enough, it will eliminate the vapor or steam jacket formed when hot metal is first immersed in water

quenched structure and carry through to the tempering operation, which will account for differences in hardness and physical properties within one piece, or from one piece to another within the same heat.

SIZE OF QUENCHED PARTS

Parts of simple shape and reasonable size may be quenched directly in the desired medium, using moderate agitation. On a production basis, or with large parts, it is frequently necessary to provide sprays or pumps to flush the water or oil around the part. This may be provided by manifolds in the quenching tank with outlets so placed that a substantial flow is continually directed against the piece being quenched. The effect in size and shape of the part to be quenched on cooling rate of water and various oils are shown in Fig. 7. As the size of the part increases, the cooling rate increases. This is less pronounced for "fast" quenching oils, indicating a distinct advantage for such an oil for quenching heavier sections.

INTERRUPTED QUENCHES

Frequently it is necessary to quench large pieces of high-alloy steel in water, since oils do not provide a sufficiently rapid quench to harden the materials in these sections. In such cases, the part, if allowed to remain too long in water or brine, may acquire internal stresses so high that rupture follows. For such parts, the expedient of a "time quench" may be used, in which the steel part is held in the water or brine for a definite period of time, and then the quench is immediately completed in oil, at a much slower rate. In many classes of work, the period of time in the first quenching medium is extremely critical if rupture is to be avoided, and unless done mechanically the operator must time each quench in seconds. Often, only a careful control of quenching conditions permits the hardening of some sections of certain compositions by this method. Under any condition, steels which are fully hardened should be removed from the quench while still warm, and then promptly tempered.

Austempering. This type of interrupted quench consists of immersing the steel in a bath maintained at a constant temperature (usually between 350 and 800 F.), and holding the part in this bath for a sufficiently long period of time to transform the austenite isothermally into intermediate transformation products corresponding to tempered martensite, that is troostite or sorbite. Such hardening produces a tough product with Rockwell hardness between 48C and 55C. The method is used commercially to heat-treat wire where high ductility is desirable, without introducing high quenching stresses and possible distortion or cracking.

Martempering. This type of interrupted quench consists of thoroughly heating the part above its transformation temperature, and then transferring it to a liquid salt bath maintained at or near the point where martensite begins to form. The work is held in the salt bath for a sufficient time to equalize temperature throughout, after which it is removed and cooled in air. Conventional tempering may follow.

The temperature of the salt bath should be slightly above the temperature at which martensite begins to form; otherwise, an appreciable quantity of martensite will form and defeat the purpose of the process. This temperature varies with different steels, but 400 F. has been found satisfactory. The process is applicable commercially, because pieces may be held in the salt bath for considerable periods after equalizing in temperature with no effect upon the result.

PREVENTING DISTORTION

The faster that heat is removed during quenching, the greater is the inequality of cooling and the development of residual strains. This produces warpage and size change. Fast quenching is also a contributing factor towards breakage when pieces are straightened. Factors that help to prevent distortion, size change and breakage resulting from heat-treatment for hardening are listed in Table 4. In general, attempts should be made to slow down quenching speed when trouble is encountered. This may be done by lowering the hardening temperature, by reducing the amount of agitation in quenching, and by changing the type or viscosity of the quenching fluid. A stress anneal after rough machining is beneficial in reducing warpage during quenching. It is advisable to have all surfaces of a flat part finished alike; parts rough machined on one side and ground on another produce an unbalanced condition in heating and subsequent cooling, and cause distortion.

QUENCHING SURFACE-HARDENED STEELS

In order to develop the high hardness and wear resistance desired in case-hardened steels, a good quench suitable for the analysis, size and design of the article treated is necessary. In general, water is used as the cooling medium for carbon steels except in very small sizes, and alloy steels are quenched in oil except in larger size and lower alloy contents. Because of the low carbon core, it is usually possible to quench any of the alloy steels in water without cracking them, but because of less distortion, oil is the

Table 4 — PRECAUTIONS THAT PREVENT HEAT-TREATING TROUBLES

TO PREVENT CRACKING

1. Use care when placing cold steel in a high-heat furnace.
2. Bring the steel uniformly to temperature.
3. Avoid localized heating from direct impingement of the flame on the piece.
4. If overheated, cool in air to room temperature and proceed with the correct hardening treatment.
5. Preheats are frequently used with steels containing tungsten, chromium, vanadium and molybdenum.
6. Double preheats of 600 and 1200 F. are frequently used when hardening high-carbon high-chrome and hot-work steels.
7. Triple preheats of 600, 1200 and 1500-1600 F. are frequently used when hardening high-speed steels.
8. Temper immediately after hardening while the piece is still warm.
9. Don't rush temper drawing time — it promotes cracks, especially during grinding.
10. Prevent scale and gas pockets on the steel's surface.

TO PREVENT WARPAGE (SHAPE CHANGE)

11. Remove mill scale from all surfaces of the piece.
12. Heat slowly and uniformly; avoid localized heating; use preheats are noted in items 5, 6 and 7.
13. Sub-anneal after severe machining of annealed steels.
14. Rotate long, flat and cylindrical pieces during heating and quenching.
15. Use low temperatures for intricately shaped pieces.
16. Finish all surfaces alike before heating.
17. If warpage is great due to overheating, cool in air to room temperature and reheat properly.
18. Place properly in the furnace; heavy parts sag if not adequately supported. Don't stack pieces on top of each other.
19. Agitate or flush the piece during quenching to prevent formation of gas pockets and soft spots which contribute to warpage during tempering.
20. When quenching long, flat and cylindrical pieces, immerse them end first into the medium, or rotate them; see Item 14.

TO PREVENT SOFT SPOTS

21. Never use tap water, except for flush quenching.
22. Don't let the quenching bath get too hot.
23. Agitate the quenching bath, use flush quenching, or move the piece in the bath by rotating or moving up and down.
24. Use grasping tongs of small area; provide proper tongs for various classes of work.
25. Never allow parts to be in contact with adjacent parts, and walls of hearing pots, furnaces and quenching baths.

TO PREVENT SIZE CHANGE (GROWTH OR SHRINKAGE)

26. Be sure pyrometers record correct steel temperature.
27. Avoid overheating and under-heating. Use sample pieces to determine size-change characteristics of steel.
28. Avoid excessive cooling rates on inner and outer surfaces, especially on intricate shapes.
29. Preheat and high heat carefully; observe items 2, 5, 6 and 7.
30. Before rehardening, give the piece a stress-relieving anneal.
31. Determine the right atmosphere for the job when using atmosphere-controlled furnaces; otherwise, excessive scale will form and cause size change.

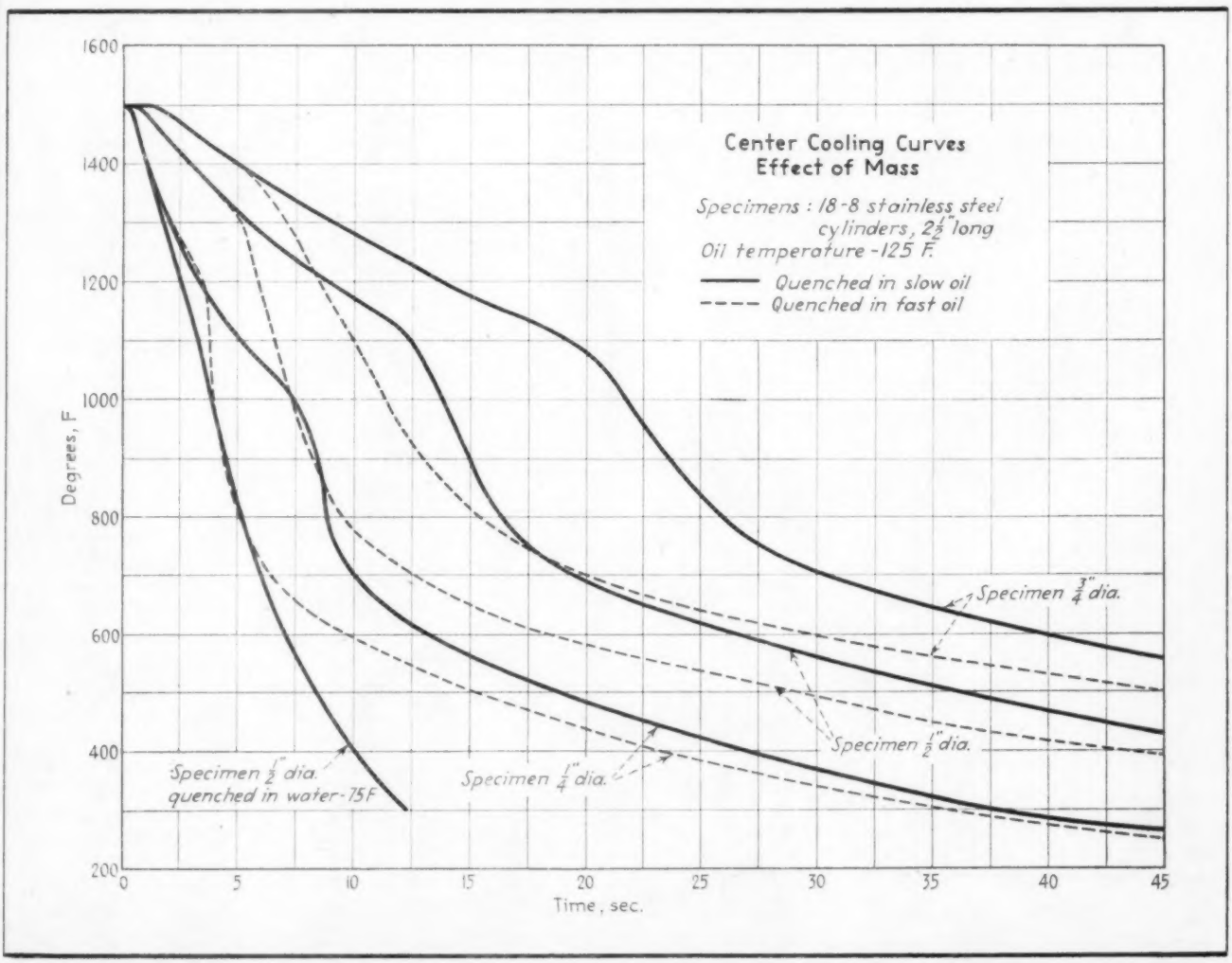


Fig. 7—Changes in cooling rates when quenching different diameter parts in water, fast oil, and regular mineral oil

much more general choice. Water quenched parts subject to shock are nearly always tempered to obtain desired toughness. In oil quenching, the heat loss becomes slow at temperatures below 400-500 F. unless the parts are quite small; consequently, oil quenched work becomes more or less self-drawn by the time it reaches room temperature. However, it is best practice to reheat the work and quench for drawing to relieve strains and increase toughness.

Cyanided steels may be quenched in oil or water, depending on the composition of the steel and the service requirements; however, brines are preferable to plain water, because gas bubbles are less apt to occur and create soft spots on the hardened surface. A mineral oil should be used for oil quenching, never a blended mineral-animal oil. The fatty matter in the animal oil will saponify with the decomposition product of the cyanide bath (alkali), causing the formation of a hard soap that will retard the quenching speed of the oil.

Typical hardening temperatures, quenching media, and tempering temperatures for various steels are listed in Table 5.

QUENCHING EQUIPMENT

Quenching equipment, as well as methods for proper control of quenching oil temperatures, depends upon the required production of quenched parts.

Batch-type continuous and flush quenching each requires different equipment. Suggestions as to equipment to be used follow:

Batch-type quenching. The simplest type of hand quenching involves a batch-type furnace in conjunction with a quenching tank containing a basket for holding the quenched pieces, which method is common in job shops for intermittent work. Pieces are frequently removed individually from the furnace with tongs, plunged into the quench, circulated in the coolant, and finally allowed to fall into the basket at the bottom of the tank. The basket is removed at intervals for unloading. A variation in the usual basket arrangement is the design shown in Fig. 8. Where a part must be quenched quickly from the heat furnace, the quenching tank can be placed directly below the furnace so the parts may be dropped through the bottom of the furnace into the tank. Batch-type quenching equipment can be timed automatically to permit accurate duplication of quenching cycles, insuring that the steel be withdrawn from the tank at exactly the right time. This is important with some alloy and carbon steels, which check, crack or build up high residual stresses if cooled to too low a temperature in the quench.

Continuous quenching. Continuous quenching implies the continuous movement of individual pieces through the hardening furnace, into the quenching bath, and frequently into the tempering furnace. One such type is shown in Fig. 9. Such equipment is used where production is continuous, as in a 24-hr. day operation, and where the volume of work to oil is relatively high.

Flush quenching. This method is used when it is desirable to quench certain surfaces of a part, and retard the quench on other surfaces. Frequently, the most convenient source of water pressure is from city mains. However, small centrifugal pumps that will draw water, brine or oil from the bottom of the tank, are used to force the quenching fluid through the flushing fixture. This type quench is often used for pieces having recessed areas which might form gas pockets.

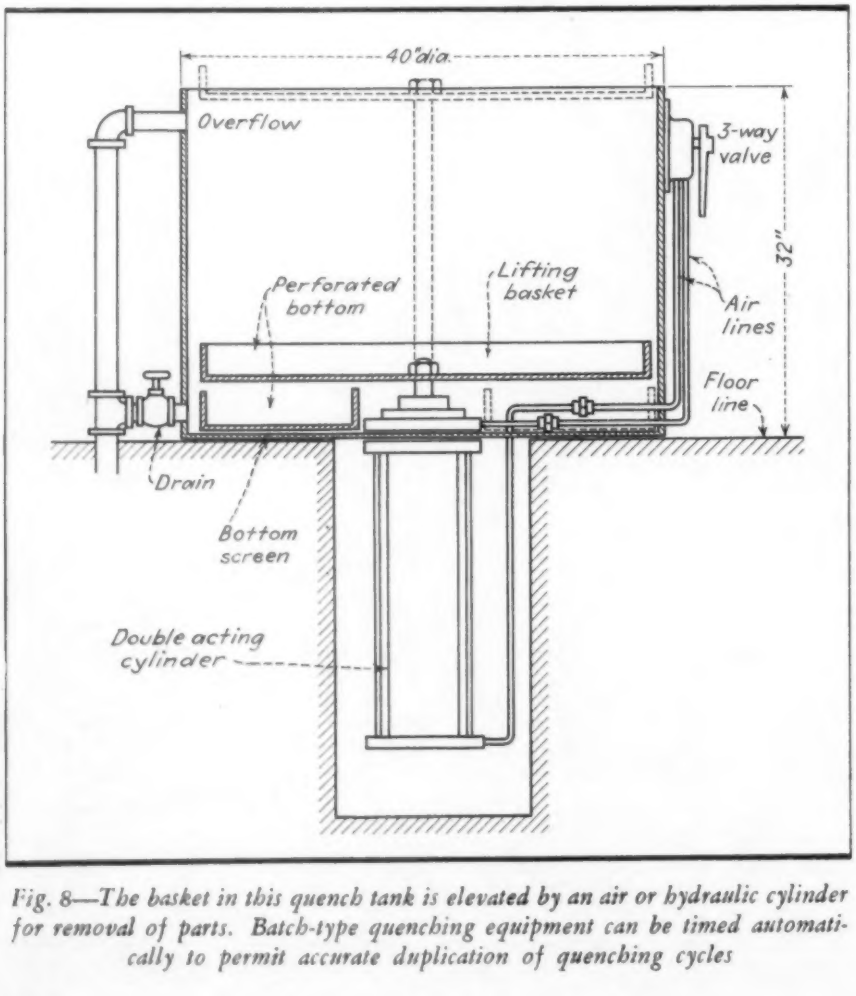


Fig. 8—The basket in this quench tank is elevated by an air or hydraulic cylinder for removal of parts. Batch-type quenching equipment can be timed automatically to permit accurate duplication of quenching cycles

COOLING THE QUENCHING FLUID

The method for cooling the quenching medium depends very largely upon the type and quantity of work to be handled. The various methods of cooling may be classified as follows:

1. *Direct radiation.* Where production is small, a tank without any special means of circulating the quenching fluid may be sufficient. The tank should be large in proportion to the quantity of heat to be removed per unit of time. Cooling is purely by radiation from the surface and the walls of the tank.

2. *Tanks without forced circulation.* The quenching tank may be immersed in a large water jacket, with or without circulation of the cooling water. Such an installation is shown in Fig. 10. The rate of transmission of the heat from the tank to the water jacket is relatively low; therefore, the larger the quenching tanks in proportion to

Table 5 — TYPICAL HEAT-TREATING TEMPERATURES AND QUENCHING MEDIUMS

CARBURIZING GRADES

S.A.E. No.	Carburizing temp., F.	Cooling method	Reheat temp., F.	Quench	Second reheat, F.	Quench	Drawing temp., F.
1010,1015	1650-1700	Water, brine	.....	....	.....	....	250-325
1016,1020	1650-1700	Water, oil	1400-1450	W,B	.....	....	250-325
1022-1024	1650-1700	Cool slowly	1650-1700	W,O	1400-1450	W,B	250-325
1025,1030 1111,1112	1500-1650	Water, oil	.....	....	.....	....	Optional
1115,1117	1650-1700	Water, oil	1400-1450	W,O	.....	....	250-325
1118,	1650-1700	Cool slowly	1400-1450	W,O	1400-1450	W,B	250-325
1320	1650-1700	Oil	1400-1500	O	.....	....	250-300
	1650-1700	Cool slowly	1525-1575	O	1375-1425	O	250-300
	1500-1650	Oil	.....	....	.....	....	250-300
2317	1650-1700	Oil	1350-1500	O	.....	....	250-300
	1650-1700	Cool slowly	1500-1550	O	1350-1400	O	250-300
	1400-1650	Oil	.....	....	.....	....	250-500
2515	1650-1700	Cool in box	1325-1475	O	.....	....	250-400
	1650-1700	Cool in box	1500-1550	O	1325-1375	O	250-400
3115,3120	1650-1700	Oil	1400-1500	O	.....	....	250-300
	1650-1700	Cool slowly	1400-1500	O	.....	....	250-300
	1650-1700	Cool slowly	1450-1500	O	1375-1425	O	250-300
3310	1650-1700	Oil	1375-1425[A]	O	.....	....	250-300
	1650-1700	Cool slowly	1525-1575	O	1375-1425	O	250-300
4023,4032	1650-1700	Oil	.....	....	.....	....	250-300
4119,4125	1650-1700	Oil	.....	....	.....	....	250-400
4320,4615 4620,4815 4820,5120	1650-1700	Oil, or slowly	1425-1525[A]	O	.....	....	250-300
	1650-1700	Cool slowly	1425-1525	O	1375-1475	O	250-300

HEAT-TREATING GRADES[B]

S.A.E. No.	Hardening temp., F.	Quench	S.A.E. No.	Hardening temp., F.	Quench	S.A.E. No.	Hardening temp., F.	Quench
1025,1030	1575-1650	W	2330	1450-1500	O	5150	1450-1550	O
1035,1036,1040	1525-1575	W,O	2340,2345	1425-1475	O	52100	1425-1475	W
1045,1050	1450-1525	W,O	3125,3130	1500-1550	O,W	52100	1500-1600	O
1052,1055	1450-1550	O	3135,3140,3141	1500-1550	O	6150	1550-1650	O
1060,1066,1070	1450-1550	O	3145,3150	1500-1550	O	9260	1500-1650	O
1080,1085	1450-1500	O	3240	1475-1525	O	51210	1750-1825	O
1095	1430-1500	W,B,O	4130	1550-1650	O,W	51310	1750-1850	O
1095	1500-1600	O	4137	1525-1625	O	51335	1800-1858	O,A
1132	1525-1575	W,O	4145,4150	1500-1600	O	X51410	1750-1850	O
1137,1141,1145	1500-1550	W,O	4340	1475-1525	O			
1330	1525-1575	W,O	4640	1450-1500	O			
1335,1340	1500-1575	O	5140	1475-1600	O			

TOOL STEELS[C]

Type	Carbon	Tungsten	Chromium	Vanadium	Molybdenum	Cobalt	Nickel	Hardening temp., F.	Quench	Tempering temp., F.
Carbon	1.10	....	....	....	....	....	....	1400-1525	W,B	300-650
W-finishing	1.50	6.25	1.80	0.30	0.50	....	....	1450-1550	W,B	300-600
High C, low W	1.30	2.50	1.00	0.30	....	....	....	1475-1650	O	350-600
High C, high Cr	2.50	2.00	14.00	1.25	0.30	1.00	1.00	1700-1750	O,A	400-1000
High C, high Cr	1.70	....	14.00	1.20	1.25	4.00	1.00	1800-1900	A	400-1000
W-Co high speed	0.90	23.00	4.75	2.50	1.25	15.00	....	2325-2375	O,A,MB,P	1000-1150
Mo-Co high speed	0.90	2.00	4.75	2.50	10.00	8.00	....	2200-2350	O,A,MB,P	950-1100
18-4-4 & 18-4-3	1.30	19.00	4.75	4.00	1.00	....	....	2250-2300	O,A,MB,P	1050-1100
18-4-1	0.80	21.00	4.75	1.50	....	....	....	2250-2350	O,A,MB,P	850-1150
14-4-2 & 14-4-1	0.80	15.00	4.75	2.20	....	....	....	2325-2375	O,A,MB,P	1000-1150
High W hot work	0.60	16.00	4.50	0.60	....	....	....	1850-2150	O,A	1000-1250
Cr-Ni-Mo	0.90	0.50	1.50	....	0.75	....	3.50	1450-1625	O	300-500

NOTES: [A] Reheat may be omitted when automatic quenching follows gas carburizing.
[B] Temper to desired hardness.
[C] Chemical analyses show maximum of each constituent in any one tool steel.
Quenching mediums: W—water, O—oil, A—air, B—brine, MB—molten lead bath, P—water-cooled plates.

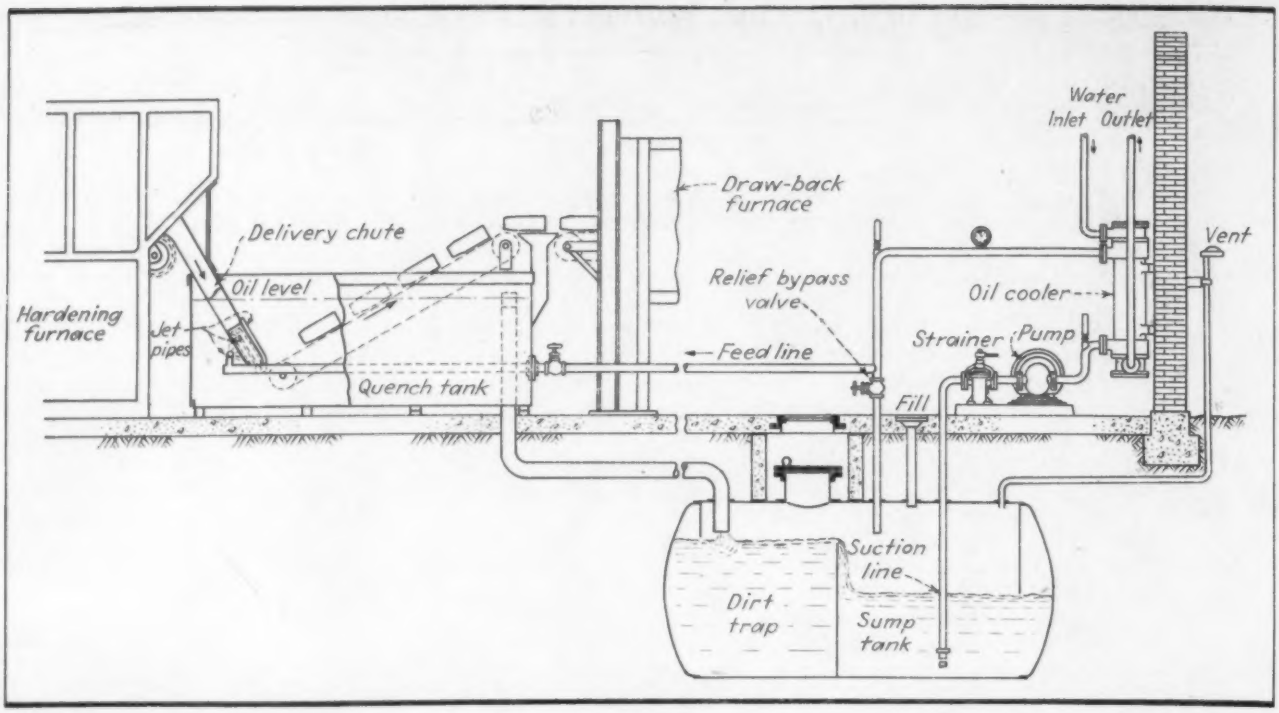


Fig. 9—Where steady production of quenched parts is demanded, or where volume of work to oil is relatively high, continuous quenching equipment is used. Accurate duplication of hardness in quenched parts result

the wall surface, the lower will be its efficiency. Consequently, this design is limited to small installations.

The quenching tank may be supplied with coils through which cold water or brine circulates. The efficiency of this method depends upon the cooling surface of the coils in proportion to the volume of the tank. Efficiency is relatively low, but greater than that for the tank mentioned in the foregoing paragraph. This design is also limited to comparatively small installations. Usually, the tanks are equipped with baffles, and the quenching oil is circulated over the coils by a motor-driven propeller at the bottom of the tank. The amount of water-cooling pipe per pound of steel quenched per hour is about 0.14 ft. of 3 in. wrought-iron pipe, 0.21 ft. of 2 in. pipe, or 0.38 ft. of 1 in. pipe. Water circulation through these pipes should be about 0.60 gal. of water for each pound of steel quenched per hour.

3. *Tanks with forced circulation.* In this method, the oil usually overflows into a sump tank from where it is pumped through a heat-exchanger and back into the quench tank. A typical installation is shown in Fig. 9. Usually, circulation of oil is about 0.65 gal. per hr. per pound of steel quenched. The circulation of water in the heat-exchanger is the same.

In some types of forced circulation cooling systems, the sump tank is made large enough to cool the oil by direct radiation, and the oil pumped directly back into the quench tank. In another system, the sump tank is equipped with cooling coils through which water or brine is passed. In still another arrangement, the quenching oil is cooled by spraying in the atmosphere or aerating, returned to the sump tank, and then circulated back to the quench tank; however, this method is open to the objection of fire hazards, especially if used in the cooling of hot oil. Still another method utilizes cooling coils where the quenching oil is pumped through coils and cooled by direct radiation to the atmosphere.

When water is used as a coolant in heat exchangers, or in cooling coils immersed directly in the quenching tank, the lowest temperature which can be obtained by the quenching medium is slightly higher than that of the water. When lower temperatures are desired, it is necessary to use a refrigerating system. With the proper design, any desired temperature of the quenching fluid can be produced by this method. It has the advantage of small size and maximum efficiency, but the disadvantage of high initial cost and comparatively high cost of operation and maintenance.

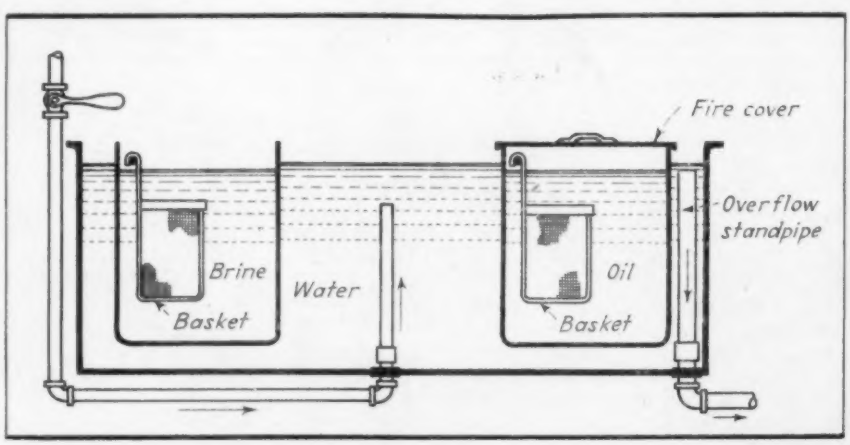


Fig. 10—This set-up can be used for intermittent quenching, and is especially suitable for hardening small quantities high-speed steel tools. Flushing equipment can be added for differential quenching

Chart for Determining Blanking Pressure—1

Courtesy, University of California

THERE ARE TWO practical methods of determining blanking or shearing pressure: by the use of the nomograph on the accompanying page, or by use of a simple formula. When the blanking pressure is found for any job, it is then possible to select a press with sufficient tonnage rating. Moreover, the pressure required to form a part is never greater than the pressure required for blanking. And the pressure required to draw a part cannot exceed the tensile strength of the material, so that only the blanking pressure need be considered in selecting a press for the operation.

Use of the nomograph is as follows:

Given: Material—24ST aluminum, 0.051 in. thick. Part to be blanked, 3 in. in diameter.

1. Length of sheared edge $=\pi D=$ 9.42 in.
2. Find 0.051 on Scale 1 (at point 1) and 9.42 in. on Scale 4 (at point 2).
3. Connect points 1 and 2.
4. The line connecting points 1 and 2 intersects Scale 2 at 0.480, or point 3.
5. From the table of shear strengths for various materials, it will be seen that the shear strength for 24ST is 40,000 lb. per sq. in.
6. From point 4 on Scale 5 (representing 40,000 lb. per sq. in.) draw a line to point 3 on Scale 2.
7. The line connecting points 3 and 4 intersects Scale 3 at point 5, giving a reading of 9.8 tons.

The formula for blanking pressure is:

$$P=\frac{SLT}{2000}$$

Where:

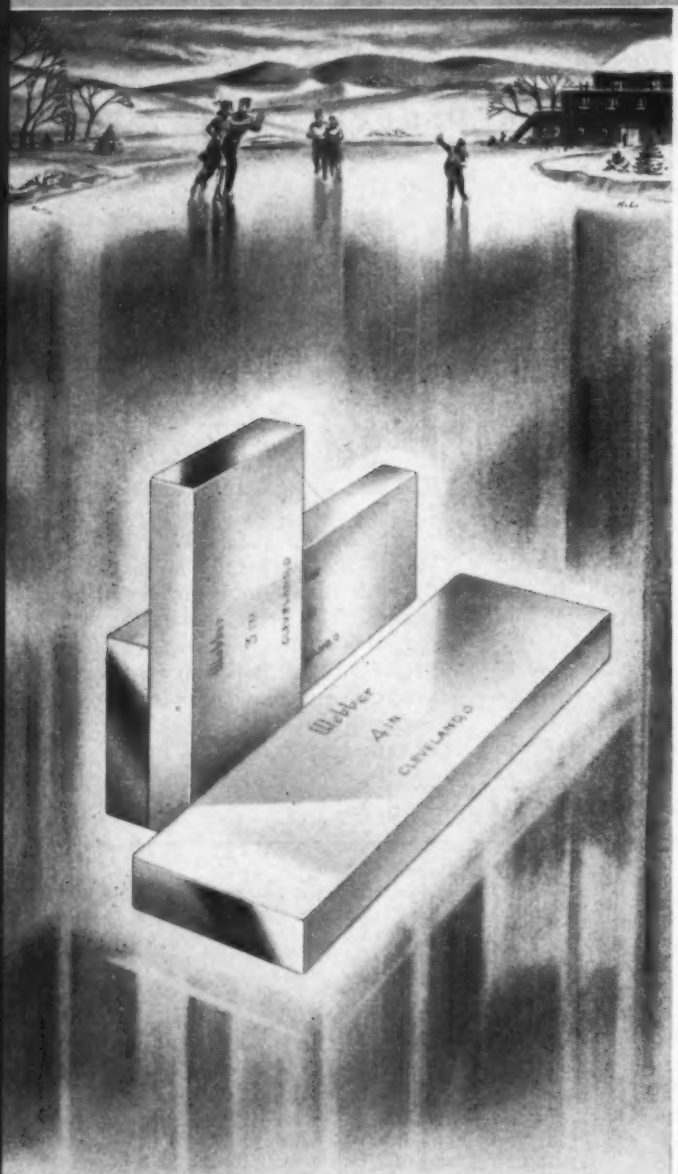
P=pressure in tons
S=shear strength of material
L=sheared length in inches
T=material thickness in inches

When the above problem is calculated with the formula, the result is 9.6 tons. The error in reading the nomograph is not important, because an error of 500 pounds would not impose an excessive load on the press, considering the factor of safety used in the design of such equipment.

SHEAR STRENGTH OF VARIOUS MATERIALS, Lb. per Sq. In.

FERROUS MATERIALS	
Carbon Steel:	
Soft open-hearth annealed	42,000
Case hardened, SAE 1020 water-quenched and drawn to 400 F.	60,000
SAE 1045 hardened in water, and drawn to 800 F.	90,000
Chromium-Molybdenum Steel:	
SAE 4130 Tensile Strength, 90,000	55,000
SAE 4130 Tensile Strength, 100,000	65,000
SAE 4130 Tensile Strength, 125,000	75,000
SAE 4130 Tensile Strength, 150,000	90,000
SAE 4130 Tensile Strength, 180,000	105,000
Nickel Steel:	
SAE 2320 drawn to 800 F. and oil quenched	98,000
SAE 2330 drawn to 800 F. and oil quenched	110,000
SAE 2340 drawn to 800 F. and oil quenched	125,000
Nickel-Chromium Steel:	
SAE 3120 Drawn to 800 F.	95,000
SAE 3130 Drawn to 800 F.	110,000
SAE 3140 Drawn to 800 F.	130,000
SAE 3230 Drawn to 800 F.	135,000
SAE 3240 Drawn to 800 F.	150,000
SAE 3250 Drawn to 800 F.	165,000
Rivet Steel	44,000
Structural Steel	45,000
Wrought Iron	40,000
NON-FERROUS MATERIALS	
Aluminum Alloys:	
2S-O	9,500
2S-1/4H	10,000
2S-1/2H	11,000
2S-3/4H	12,000
2S-H	13,000
3S-O	11,000
3S-1/4H	12,000
3S-1/2H	14,000
3S-3/4H	15,000
3S-H	16,000
4S-O	16,000
4S-1/4H	16,000
4S-1/2H	18,000
4S-3/4H	20,000
4S-H	21,000
11S-T3	30,000
17S-O	18,000
17S-T	35,000
17S-RT	36,000
Alclad 17S-T	32,000
Alclad 17S-RT	32,000
A17S-O	15,000
A17S-T	25,000
24S-O	18,000
24S-T	40,000
24S-RT	41,000
Alclad 24S-T	39,000
Alclad 24S-RT	39,000
51S-O	11,000
51S-W	24,000
51S-T	30,000
52S-O	18,000
52S-1/4H	20,000
52S-1/2H	21,000
52S-3/4H	23,000
52S-H	24,000
53S-O	11,000
53S-W	22,000
53S-T	26,000
Brass, Red:	
Tensile strength 85,000	43,000
Tensile strength 43,000	27,000
Brass, Drawing:	
Tensile strength 46,000	30,000
Bronze:	
Tensile strength 37,000	25,000
Phosphor Bronze:	
Tensile strength 45,000	33,000
Copper:	
Tensile strength 32,500	21,000
Lead	3,500
Magnesium Alloys:	
Dowmetal E—Not heat-treated	14,000
" A—Not heat-treated	15,000
" A—Heat-treated	15,000
" T—Not heat-treated	14,000
" G—Heat-treated	16,000
" F	18,000
" E	18,000
" A	19,000
" T	18,000
" M	16,000
Monel Metal:	
Tensile strength 69,000	42,900
Tensile strength 108,000	65,200
'K' Monel:	
Tensile strength 97,500	65,300
Tensile strength 155,600	98,700
Nickel:	
Tensile strength 68,000	52,300
Tensile strength 120,500	75,300
Inconel: (nickel-chromium-iron alloy)	
Tensile strength 80,000	59,000
Tensile strength 85,000	61,000
Tensile strength 90,000	63,000
Tensile strength 95,000	64,000
Tensile strength 100,000	66,000
Tensile strength 105,000	68,000
Tensile strength 115,000	71,000
Tensile strength 125,000	74,000
Tensile strength 140,000	78,000
Tensile strength 155,000	83,000
Tensile strength 160,000	84,000
Tensile strength 165,000	85,000
Tensile strength 170,000	86,000
Tensile strength 175,000	87,000
Tin	5,000
Zinc	14,000
Zinc-Base Die-Casting Alloys:	
Zamak Alloy #2	45,800
Zamak Alloy #3	30,900
Zamak Alloy #5	38,400
Zamak Alloy #6	38,000

SURFACE FINISH { ONE OF THE 5 THINGS TO LOOK FOR WHEN YOU BUY GAGE BLOCKS



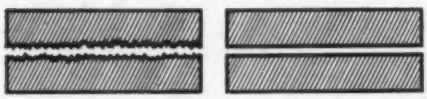
Look for these 5 things when you buy Gage Blocks –

1. Dimensional Accuracy
2. Stability
3. Surface Finish
4. Wearing Quality
5. Service after the sale

● Surface finish is of vital importance in gage blocks because:

1. It provides maximum accuracy of working surfaces.
2. It reduces wear. A rough surface composed of ridges and valleys wears rapidly when rubbed against another such surface.

   THIS wears faster than THIS.



3. It provides easier handling. Blocks can be "wrung" together more easily and cling harder.

Webber Gage Blocks have the finest surface finish which it is commercially possible to put on steel. This finish is obtained by methods and equipment developed by Webber technicians over a period of many years for their exclusive use in finishing Webber Gage Blocks. Inspection of the finish of Webber blocks is done on the most modern, improved, sensitive surface testing equipment.

No Webber Gage Block leaves the factory unless it meets Webber standards for surface finish. These standards are considerably higher than those set by the National Bureau of Standards.

For the finest surface finish as well as all other essential qualifications of the best gage blocks – buy Webber. Sets available promptly as follows:

Set No. 84A	$350.00
Set No. 84B	$235.00
Set No. 43A	$185.00
Set No. 43B	$150.00
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Set No. 38B (Thin Blocks)	$155.00
Set No. 14A (Angle Blocks)	$450.00

Webber GAGE COMPANY

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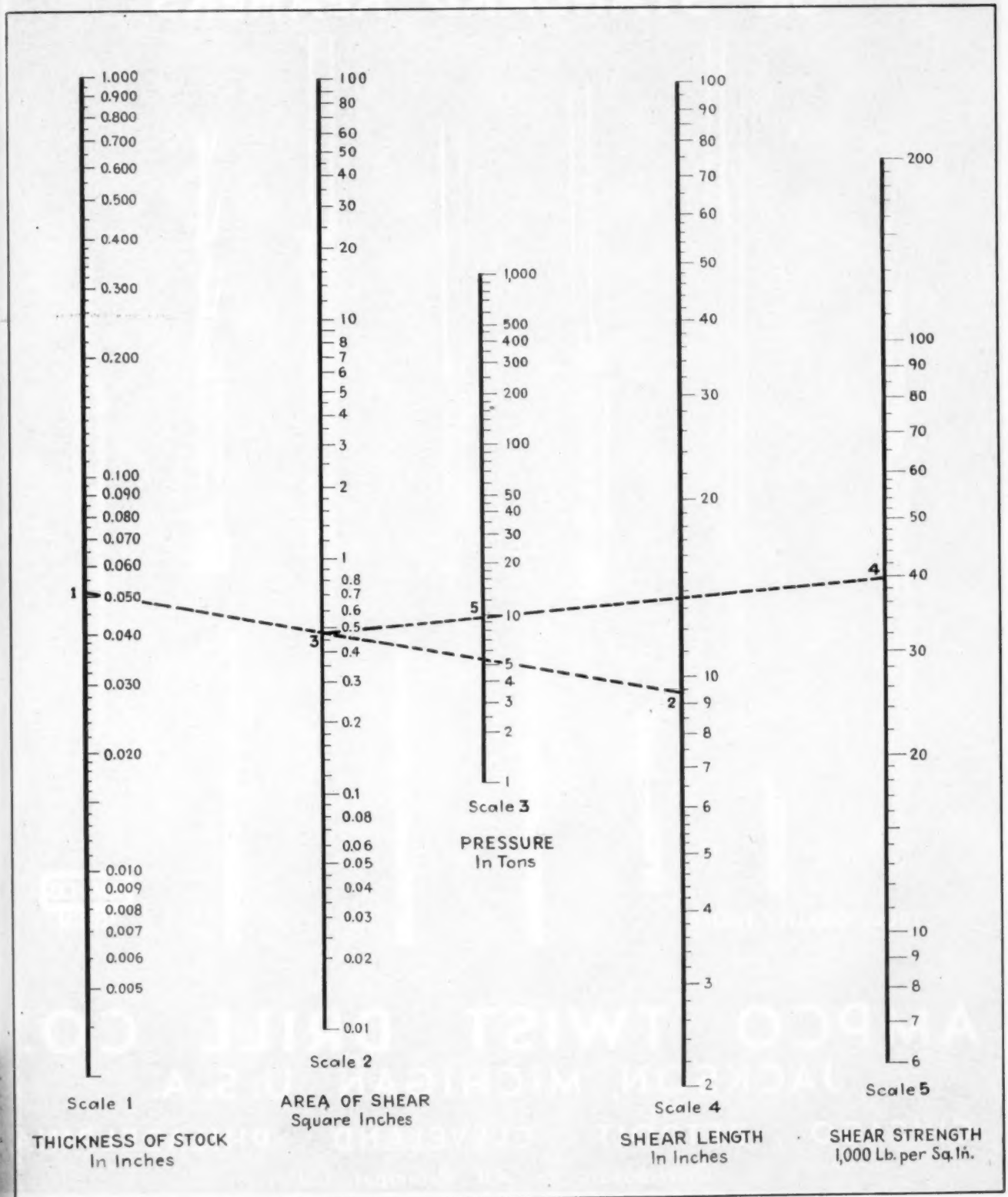
AMERICAN MACHINIST REFERENCE BOOK SHEET

Chart for Determining Blanking Pressure—II



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Machine Tools Reemphasized

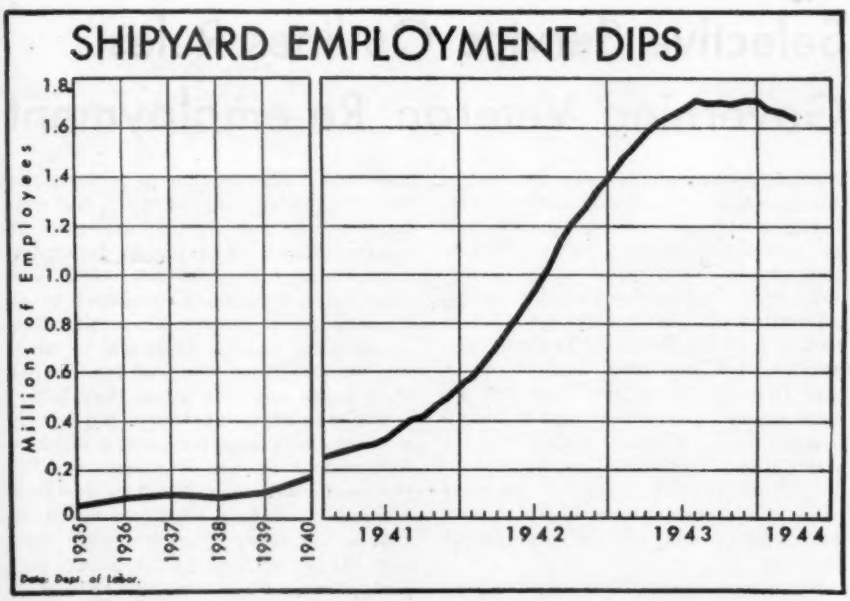
The invasion of Europe is focusing more attention upon the necessity for completing as soon as possible the new and expanded program in large shell and artillery weapons. This program has been greatly enlarged within the last few weeks and has put upon machine tool builders a new burden. As a result some builders are being compelled to pare down or abandon certain munitions work to make room for manufacturing more machine tools, while others are in the uncomfortable position of being compelled to turn down machine tool orders because of non-machine-tool commitments. Considered as an industry, machine tool builders will be well engaged the remainder of this year, but business is far from being evenly spread. While deliveries have been lengthening for specified companies, many builders are looking hard for new orders.

Manpower Troubles Builders

The unexpected spurt in machine tool production has affected Canada, too. The Dominion has a sizable new shell-making program of its own. Canadian makers of machine tools are now busy on special shell lathes not only for shops in their own country, but also for U. S. contractors. May is believed to have continued the performance in April, when new machine tool orders for the U. S. industry exceeded shipments for the first time in almost two years. This reversal in trend, however, is not likely to hold long. Russia is an active buyer of machine tools and will be one of the biggest sources of new business the remainder of this year. Builders are having difficulty securing help to augment their depleted forces.

No Invasion Changes Yet

No major changes are reported yet in war production programs arising from the invasion of France. Schedules calling for a reduction in certain types of fighter planes are still in force. Only in the larger bombers is output expected to accelerate. The switch to manufacture of bigger airplane engines is being accomplished on time. During May 155 merchant ships totaling 1,537,915 tons were built, raising to 719 the number of ships produced this year. Sixteen Victory ships were delivered last month, compared with 10 the preceding month. Liberty ships dropped from 79 to 67. West Coast yards were responsible for 44 percent of May's total, East Coast yards 32 percent and Gulf Coast 22 percent.



Great Efficiency, Less Manpower—Actual output of shipyards continued to expand in the latter months of 1943 and has held up well in 1944, despite a reduction in employment; this is attributed to increased output-per-man resulting from mass production, ship standardization and wider use of welding. Women now represent 10 percent of shipyard manpower, in spite of the heavy nature of the work in the yards

TO OKAY CIVILIAN TOOLS

WASHINGTON—War Production Board is to notify industrial plants "within a few days" to begin ordering machine tools they will need for civilian production, War Mobilization Director James F. Byrnes told the Senate's war contracts subcommittee.

Tool builders, Director Byrnes went on, will be authorized to fill such orders whenever plant capacity permits.

This plan, he said, is aimed at insuring the most rapid possible reconversion to peacetime production when the defeat of Germany brings war production cutbacks estimated as high as 50 percent of the war program.

Steel, Copper, Nickel Tight

Large orders for shell steel and increases in plate demand are helping to keep steel operations at the top. The tightest items appear to be plates, sheets and certain sizes of bars. Just as most people in the industry anticipated a letdown, the steel situation became tighter than ever. Cancellations are at the lowest point of the year. The principal bottleneck in copper is production of copper rod and tubing. Supply and demand for copper strip are more in balance than previously because of the shift from small arms (using strip) to artillery ammunition (using heavy sheets). The overall copper supply has not improved enough to permit relaxation of restrictions on its use. The amount of nickel available is hardly more than sufficient to meet the demand from month to month.

To Produce Ranges

Production of 88,000 domestic electric ranges will be permitted in 1944, under War Production Board's policy of permitting resumption of essential civilian production where there will be no interference with materiel output. Some of the number have already been produced under emergency arrangements. Individual production quotas for the remainder will be assigned manufacturers able to produce without interfering with war work.

Electric iron production authorizations have passed the half-way mark in the program for 2,000,000 in 1944. The outlook for meeting the scheduled program is favorable. Irons will probably be on dealer shelves in early fall for unrationed sale.

Chances for early resumption of production of household mechanical refrigerators seem small.

Production of 100,000 propeller type, 12 and 16 in. fans will be permitted, if it does not hinder war production. None will be for home use.

Uniform Termination Article Sets Settlement Formulae

Uniform termination article adopted by Joint Contract Termination Board establishes profit percentages for finished and unfinished work in hands of prime and subcontractors

WASHINGTON—The Joint Contract Termination Board has adopted unanimously a uniform termination article for settlement of claims made under fixed-price subcontracts.

Regarded as part of the contract settlement program proposed by the Baruch-Hancock report on postwar economic policy, the new article was described "a major step in speeding of payment to subcontractors when their war business is canceled. . . ." It supplements the Uniform Termination Article for prime contracts made effective last Jan. 8, and, in general, applies the same settlement principles to subcontracts as the earlier article did to prime contracts. The subcontract article is short enough to be printed on the back of contracts or otherwise inserted.

Directs General Use

War Mobilization Director James F. Byrnes instructed all procurement agencies to recommend use of the new article to all contractors and subcontractors.

Joint Board policy will be to require all procurement agencies to approve promptly fair and reasonable settlements arrived at by following principles of the new article. Legislation passed by the Senate and awaiting House approval would give procurement agencies discretionary power to make direct subcontract settlements; if it becomes law, procurement agencies will follow principles outlined in the new article.

Joint Board policy will be to encourage negotiated settlement of subcontracts to the same extent that prime contracts are so settled. As does the prime contract article, the subcontract article provides that when agreement cannot be arrived at by negotiation, settlement will be made by a prescribed formula. Formula in both prime and subcontract articles is essentially the same.

Profits Set

The subcontract formula provides that full contract price shall be paid for all completed articles, and nothing paid on portions of the work which have not been begun and on which no costs have been incurred. Subcontractors will be entitled to actual costs incurred on work begun but not completed, if those costs are properly allocable to the work in question, plus an allowance for profit not to exceed six percent of the whole of the costs. The profit formula is broken down to provide a two percent top profit for materials not processed, plus eight percent profit on all other costs, except that the aggregate profit may not exceed six percent of the costs.

It was emphasized that mere inclusion of the standard subcontract article in a contract does not make it a war contract or a proper claim against the government. In prime contract settlement, subcontract claims must be properly allocable to the prime contract to constitute a claim on the government.

The Joint Board will establish procedures whereby subcontracts which represent tiny sums can be validated automatically provided certain safeguards are observed.

Blames Lack of "Know-How"

WASHINGTON—Industry's lack of the "know-how" of contract termination may be the reason why no claims have been filed by holders of terminated contracts on which more than $500,000,000 stands to be paid, Col. D. N. Hauseman, director of the Army Service Forces Readjustment Division, told the National Association of Purchasing Agents recently. Hauseman suggested installation of sound inventory control systems which would insure adequate stocks while holding inventories at reasonable levels.

Hauseman urged that industry play a larger role in distributing surpluses lest the job fail and bring the marketing disaster which everyone is anxious to avoid. The government, he added, will have to take a "courageous" attitude toward scrapping obsolete material.

'43 RENEGOTIATION RULES OUT

WASHINGTON—Four chapters of new regulations promulgated by the War Contracts Price Adjustment Board to govern renegotiation of war business done in fiscal years ending after June 30, 1943, have been issued. With them are revisions of the first four chapters, orignally issued April 19. The new publication is the first complete codification of detailed rules to be issued publicly in connection with renegotiation.

Copies of the eight chapters may be had from the U. S. Superintendent of Documents for $2, which will include 12 monthly supplements embodying revisions which will be made by WCPAB.

Selective Service Outlines Rules Governing Veteran Re-employment

WASHINGTON—Policies governing the mandatory reemployment of discharged veterans have been determined by national Selective Service Headquarters so as to leave as few questions open to disagreement as possible.

Pointing out that constitutionality of section 8 of the Selective Training and Service Act has been upheld by a U.S. District Court and that the re-employment guarantees apply to all persons who entered active service after May 1, 1940, whether drafted or not, Draft Director Lewis B. Hershey ruled that conscientious objectors are not eligible for the re-employment benefits.

Employers are entitled to proof that returning employes have completed their military service satisfactorily, and no discharges other than honorable or under honorable circumstances will constitute such proof. It was also emphasized that returning employees must apply for reemployment within 40 days after completion of service.

Veterans must be able to perform the jobs for which they re-apply, but employers may not set up "arbitrary or unreasonable" standards to determine qualification. In doubtful cases, Hershey ruled, veterans are entitled to an opportunity to prove their ability. Veterans may not be required to meet any standards for their old jobs higher than those applying when they left.

Decision as to whether a job left by a serviceman was temporary must be determined on the circumstances of the particular case, Hershey declared. Normally, workers employed to fill the places of other workers who went into the service occupy temporary jobs and possess no re-employment rights even though they subsequently enter the service.

Likewise, decision as to whether changed circumstances render it "impossible or unreasonable" for an employer to offer reemployment must be made on the basis of individual circumstances. "Convenience" of an employer

must be distinguished from unreasonableness or impossibility, Hershey warned, and the fact that re-employment of a veteran would cost more than continued employment of a nonveteran is not evidence of unreasonableness or impossibility of reemployment. Neither the employment of women at what once were men's jobs nor promises of permanent employment are excuses for failure to reemploy veterans.

May Claim Back Pay

Seniority rights accumulate during military service, and the reemployment right obtains even though it causes the discharge of a nonveteran with more seniority than the veteran, Hershey ruled. Veterans may not be required to change location of employment without consent, and back pay may be claimed by veterans who are not reemployed reasonably promptly. Once reemployed, veterans may not be discharged without cause for one year. Cause is to be determined by prevalent industry and area standards. During the year, veterans may not be displaced from the positions of reemployment by nonveterans with greater seniority.

Where veterans have waived the right to reemployment, positive evidence will be required, and the burden of proof will rest upon the employer. Veterans may not be required to disclose confidential medical or physical information as a condition of re-employment, and local draft boards may not distribute it.

D-Day Patriotism Suspends All But Two Major Labor Disputes

NEW YORK—Except for two disputes in the metal working industry, the patriotic feelings engendered by news that the great invasion had at last been launched recessed all major labor trouble. D-Day psychology brought industrial peace to Detroit, making the nation's strike capital strike-free for the first time in a very long while, and ended serious steel and coal walkouts in the busy Birmingham production area.

Most of the labor imbroglios ended, like the Pullman-Standard walkout in Birmingham, with disputed issues unsettled but in a spirit of cooperation which promised to dispose of outstanding questions by peaceful means while production continued. The argument in the Pullman plant turned on piece rates and flared into a stoppage when the company announced it would increase its normal daily work line from 18 to 21 all-steel freight cars. Invasion news induced the company to agree to the union demand that other portions of the labor agreement which had been accepted be put in immediate effect, and induced the union to refer the piece rate issue to the National War Labor Board for arbitration.

The two important disputes which survived the renascent patriotism fired by Eisenhower's communiques involved 5,000 AFL machinists in 104 San Francisco machine shops and 12,000 CIO employees of the Wright Aeronautical Corp. in Lockland, Ohio.

The West Coast machinists, wrangling with the California Metal Trades Association since an old contract expired last March over the demand that any new wage adjustments be made retroactive, have refused to work more than 48 hours a week. Those who do are disciplined by the union and, in some cases, discharged at union insistence. The NWLB has directed the San Francisco local to quit imposing penalties on its members in what is perhaps the most forthright and sweeping order it has ever addressed to a labor organization. It has promised to refer the union's continued defiance to the President thereby implying a threat of seizure. But neither the board's strong language nor the employers' D-Day appeals moved the union to alter its position.

Color Caused Trouble

The strike at Wright Aeronautical is a different breed of wildcat. There, the entire apparatus of CIO's United Automobile Workers was employed to get the members back to work. They had struck to protest the transfer of seven Negro workers into an all-white department. The union had agreed to the transfer but the membership refused to go along. So serious was the tieup of production of Wright engines that before the invasion was 24 hours old, Army Air Force officers were recommending that contracts be transferred from the Lockland plant.

Washington did not seriously expect either the San Francisco or the Lockland dispute to last indefinitely and the only real question remaining as the labor front cleared was: How long can the national unity feeling of D-Day be counted on to keep war workers quiescent?

British Combine

Smith is the Name—Just off the secret list, the Smith 3-in. mobile gun is inspected by British Prime Minister Churchill. Tipped over from its shown operating position, the ceiling and base discs become wheels, to make the unit highly mobile. A towing eye is seen affixed to the gun muzzle

Tapers from A-20 to C-54

LOS ANGELES—Termination of the contract of Douglas Aircraft Co. for A-20 attack bombers being made in that firm's Santa Monica plant will probably result in the release of few, if any, workers. Preliminary contractual arrangements have been made for increased production of the C-54 cargo plane at the home plant. Company officials announce that facilities released by the tapering off of A-20 production will be converted at once to care for the expanding program of the huge cargo carriers.

Senate Group Urges Businesslike Government, Less Business Control

WASHINGTON—Prevention of unemployment, orderly disposal of surpluses and expediting of return to civilian production are major features of the 16 point report made to the Senate by its special Postwar Economic Policy and Planning Committee.

The establishment of a central office of demobilization, as provided for in the George-Murray bill, to direct and coordinate the activities of all government agencies in their demobilization activities, was recommended.

Further recommendatons include:

Prompt termination of war contracts and the clearing of war plants of present inventories; orderly disposal of surplus war property; unemployment compensation to bridge the gap for individuals during reconversion; construction projects, to be prearranged and ready for commencement immediately upon the cessation of the war, and residential construction, to stimulate home building and employment.

Would Distribute Workers

Migration and retraining of war workers, with efforts to avoid the continuance of excess labor in present boom areas, and a study of price controls and rationing, to determine which restrictions to retain and for how long;

A postwar budget to eliminate unnecessary expenditures; refinancing of Treasury obligation, after "careful consideration, and a study of postwar taxation;"

Expansion of foreign trade; prevention of monopolies and trade barriers; limitation of Congressional delegation of powers to the executive branch, and elimination of the overlapping functions of government.

The report emphasized the need for a proper "economic environment," which would include a friendly attitude of government and reasonable certainty of stable "rules of the game," freedom from frequent and conflicting departmental directives and assurances of a minimum delegation of Congressional powers, and no discrimination in favor of any segment of the economy.

Munition Production Lags

WASHINGTON—Munitions production in April—the latest month for which figures are available—was 3 percent below schedule and 2 percent below the March level. The April production was back at almost the same level as during January.

None of the broad munitions categories met schedule during April. However, within those categories, production of most of the individual "must" items kept well abreast of schedule.

Metal Treating Institute Holds its Spring Meeting

PHILADELPHIA—The spring meeting of the Metal Treating Institute, held here and at Atlantic City, May 19-21 heard Dr. Walter M. Mitchell, chief metallurgist, ordnance plant, York Safe and Lock Co., speak on "The Metallurgy of the Bofors Anti-Aircraft Gun."

Horace G. Knerr president of the Institute and of Metallurgical Laboratories, Inc., entertained the members at a reception at that firm's plant, here.

The following day the entire group gathered at Atlantic City for a business conference. President Knerr addressed the meeting on tax problems. Stanley Wishoski, president, National Industrial Publishing Co., spoke on future prospects of commercial heat treating. A symposium on shop problems and policies followed.

Industrialist Offers Plan for Postwar Unemployment Funds

NEW YORK—To build up a surplus earmarked for postwar unemployment of war workers and returning veterans, and provide funds for reconversion, Col. Willard F. Rockwell, Pittsburgh and Detroit industrialist, urges that war contractors be permitted to set aside certain sums from profits, after taxes and dividends, but before renegotiation. His six-point plan is as follows:

1. Each company to withhold from 1943, 1944 and 1945 gross income, as stated, a sum equal to one-week's average wage, for each month of continuous employment of each person on payroll, to a total of 24 week's wages for employees who have worked two years or more.

2. An equal sum to be withheld for each ex-employee in the armed forces, based on same formula.

3. Records to be kept and furnished to public agencies.

4. Disbursement of these funds to unemployed workers to start upon complete cancellation of war contracts, or in the case of graduated terminations at the discretion of a joint labor-management committee. Payments to ex-employees returning from service would start upon application.

5. Disbursements to be made in conformity with maximum and minimum payments established by state or federal unemployment compensation plans, until (a) the person benefiting receives a job of comparable skill and compensation to the one last held, or (b) until total benefits accruing to the individual are disbursed, or (c) other employment is obtained by each person entitled to such benefits.

6. Two years after complete settlement of all terminated war contracts, all withheld sums not disbursed shall be paid to the federal government.

Col. Rockwell feels that this plan will provide industry with funds for reconversion.

Appellate Court Upholds Welding Of Castings as Production Step

CLEVELAND—The U. S. Circuit Court of Appeals' reversal of the conviction of John L., Edward L. and Frank Schmeller, brothers and former officials of the National Bronze and Aluminum Foundry Co., here, has reassured manufacturers who might have been uneasy lest some well-intentioned practice involve them in difficulties.

Indicted on nine counts which charged that they had permitted the welding of defective castings in a locked room which inspectors did not enter, the U. S. Circuit Court convicted each on one count and imposed sentences of 10 years in prison and fines of $10,000.

The trial brought out that Packard, for whose Rolls-Royce engine production line the castings were being made had adopted "controlled" welding of small defects. The prosecution said the case represented an objection to concealed welding that could not be tested.

Appeal to the Appellate Court claimed that evidence was insufficient to show that mere welding made castings defective, and likewise insufficient to show that the brothers Schmeller had ordered the welding.

California Employment Drops

SAN FRANCISCO — Manufacturing employment in California is declining, despite approach of the season of increased canning activity.

Aircraft plant employment dropped from 212,300 in March to 206,100 in April, the lowest monthly record since November, 1942. Comparing month to month, 1944 employment has been consistently lower than 1943.

Private shipyards had 253,000 workers in April against 262,000 in March, the lowest total since January, 1943.

The San Francisco Bay area had its eighth consecutive monthly decline in manufacturing employment, the April total being 5,000 workers lower than March.

In the Los Angeles area, factory employment dropped from 440,700 in March to 433,500 in April—the first decline since January, 1939.

Inside Detroit

BY SILER FREEMAN

Await Invasion Effects

The invasion is still too new, too little advanced to see what its effects will be on the production picture in Detroit. But every plant is expecting changes to come as the result of D-Day.

At the Union Guardian Building, the Ordnance chiefs and experts are awaiting the reports from the fighting fronts that will mean new weapons and new designs in present weapons. Here, in what was formerly Tank-Automotive Center, the planning is done that brings better arms to American soldiers.

Already, in the news dispatches has appeared some talk about a new type of tank, bigger than the M-4 and with a lower silhouette. The Chrysler Tank Arsenal has been secretive about its present activities and this new type of tank is likely to be one of the surprises of the present campaign.

See Production Reshuffle

Automotive manufacturers are looking forward to a great deal of reshuffling in the months to come. DeSoto, Hudson, Murray and Briggs are big factors in the super-bomber program and expect to step up activities as the huge bomber begins to take the place of the Flying Fortress and Liberator in the stepped-up battle pace.

Willow Run, with its production running satisfactorily and even ahead of schedule, will likely become the one big producer of the B-24. Already it has been notified that its knock-downs will be out entirely and it will confine itself to assembled planes only.

Laid Down Law

Under the double impact of Donald M. Nelson's severe castigation and the invasion, the labor seas here seem to have smoothed, at least for the time being. Nelson, here to stem the flood of strikes which had cost much valuable production, took off his gloves and let both sides have it.

The WPB chieftain did not spare management any more than he did labor. He denounced "shortsighted elements" on both sides as imperilling not only the war program but the prosperity which the nation might expect after the war. He paid tribute to the city's ability to produce but added:

"I want to say to you frankly that too many of the defaults on the war obligations by both management and labor have come from the Detroit district, the heart of industrial America. The very name Detroit in a headline today has begun to suggest labor disputes and strikes which injure war production and spread confusion and irritation among the people and among our armed forces."

Dutch Uncle in Action

Nelson gave his verbal pasting to both sides at two meetings. At one, he addressed about 1,000 business men and industrialists and that evening talked before a group of about 250 labor leaders.

Whatever might have come out of Nelson's attack was sidetracked the next day when the actual invasion got under way. It accomplished what even the WPB chief's message might have failed to do. The shock of what might be in store for the thousands of boys in the next few months settled any pending strikes and sent all back to the plants. How long this truce will last is problematical.

Suffice to say that neither labor nor management agreed with Nelson. Each still pointed the accusing finger at the other.

Figures Show Output Sag

But in the records of the regional WPB here is proof that up to the invasion day, the production record of which this area was so proud was beginning to sag in spots. Carsten Tiedeman, regional WPB director, pointed out that April's output was back to the January level.

Exact figures showed that combat and motor vehicle production decreased 5 percent, although actually it was only 2 percent behind schedule. Combat vehicles declined 7 percent while tank output was down 2 percent from schedule, but 1 percent above the March level. The high-preference type was running 3 percent ahead.

Motor carriages for self-propelled guns was 14 percent off from March and 10 percent below schedule. Automotive vehicles as a whole were 4 percent down. Production of "ducks," however, was exactly on schedule but failed to reach the peak which had been scheduled for it.

All types of trucks, except the "heavy" heavy, over 2½ tons, showed drops and failed to meet schedules. The heavies continued to come off in increasing numbers, being about 12 percent above March. Tractors hit schedule, with an increase of 2 percent above March.

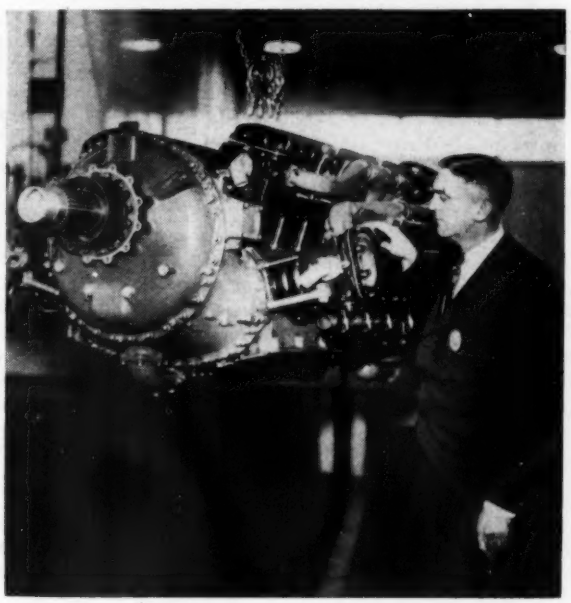
Aircraft, which includes airframes, engines, propellers, spare parts and equipment, was down 7 percent, 4 below schedule. Guns and fire control equipment were off 3 percent but ammunition was up 5 percent.

Sorensen to Willys-Overland

The future of Charles E. Sorensen, ex-Ford general manager, is now settled. He has thrown his fortunes with Willys-Overland, replacing Joseph W. Frazer, as president.

The deal is one that has been on the front burner for some time. Ward Canaday has been casting about for a new head for his company and made Sorensen a tempting stock offer that will offset any loss in salary the ex-Ford chief might sustain by the change. The stock deal will save Sorensen a good bit in income tax and he has a company that may give Ford's some post-war competition in the low-priced field.

However, Sorensen is primarily a production man, not a sales manager.



More Power to Them! —R. M. Hazen, chief engineer, Allison Division, General Motors Corp., looks over the new Allison 24-cylinder liquid cooled aircraft engine. Its approximately 3000 hp. rating is said to be greatly in excess of the most powerful power plant now in service. It has exactly twice the piston displacement of the present standard Allison 12-cylinder engine

Open Season—To test performance of combustion starters which get their power from 12. gage shotgun-type shells, an inspector at the Eclipse-Pioneer division assembly plant of Bendix Aviation Corp. daily fires hundreds of rounds of shells to simulate actual operation before delivery to the air forces

Need for Increased Production For Pacific Campaign Is Seen

DETROIT—The automotive industry will be called upon to furnish more Navy equipment as new Pacific bases are established within vulnerable range of Japan's shortened supply lines. In making this prediction, Rear Admiral H. G. Taylor, superintendent of Navy civil engineering, told the National War Material Meeting of the Society of Automotive Engineers that orders for about $250,000,000 had been placed for advanced base equipment and that approximately $110,000,000 worth had been placed in service.

Other speakers at the meeting talked of wartime developments in heat-treatment of steel, improvements in pressure ferrous castings, production methods for aircraft engines and materials for preserving parts in storage and shipment.

Stresses Cooperation

H. W. McQuaid of Republic Steel Corp. said that on the basis of experience in building aircraft engines there is a possibility of improved design of many mechanisms by applying wartime developments in heat-treating. The designer and metallurgist must cooperate, he said, the metallurgist evaluating the type, intensity and location of stresses resulting from machining, welding, heat-treating, forming and assembling. The designer on the other hand would determine the expected stresses in parts due to loading and effect upon intensity and location by deflection. Net result will be eventual usage of a lower factor of safety, which the speaker termed the "factor of ignorance."

After three years' experience with centrifugal castings, the Air Force has cut requirements for parts from ability to withstand 200 percent static load simulating actual conditions to a load a mere equal of the required load, provided tensile and elongation properties are suitable, according to E. C. Jeter of the Ford Motor Co. He looks for considerable extension of the centrifugal casting process, when the engineer is satisfied with economy and quality Air-pressure casting of specialty castings, especially in unmachinable alloys, is a growing field.

By examples, Martin M. Holben of Wright Aeronautical Corp., traced the advantages of creating a technical production unit for studying new processes and manufacturing methods. He cited the forged cylinder head, cast steel crankcase, shaved gears and cold-worked parts as being largely the outcome of these efforts.

Preservation of equipment (Ordnance) generally consists of one or more of seven steps, according to C. E. Heussner and C. O. Durbin of Chrysler Corp. They outlined various means of cleaning the parts and then methods of packaging, using various kinds of preservatives and wrappings.

Bright Postwar Era for Machinery Dealers Seen

NEW YORK—"When the world is able to turn its attention again to the arts of peace, we will witness a machine tool situation that has no parallel in history," predicted W. H. Myer, chief, machinery and motive power products unit, Bureau of Foreign and Domestic Commerce, Department of Commerce, in an address before the second wartime conference of the Machinery Dealers National Association, here.

"Notwithstanding the unprecedented production of machine tools, there are many foreign areas hungry for metal working equipment to use in making goods for their essential civilian needs. Machine tools, the basic equipment of all industry, will be needed in quantity for restoration."

A postwar condition of "excess machine tools in certain industries and certain areas," he continued, "coupled with a heavy demand for equipment for prompt delivery to other users and other countries, will offer constructive opportunities to dealers in used machines."

Urged Fair Dealing

In order properly to take advantage of postwar opportunities for exporting machinery and at the same time do a patriotic service for the country, Mr. Myer urged that American dealers be fair in their dealings with foreigners; pack their merchandise properly to prevent breakage; pay more strict attention to all details given by foreign buyers in making out forms and in packing; give courteous and careful attention to all inquiries; and endeavor to fill all foreign orders whether business is good in this country or not.

Russia, Mr. Myer said, will probably be the largest market for all types of machinery. Latin America, which before the war imported from $2,000,000 to $3,000,000 worth of new and used tools from this country a year, will "possibly double or triple" its imports from all sources for a few postwar years.

Officers Elected

R. A. Vine, president, R. A. Vine Machinery Warehouse, was reelected president of the association. Also reelected were Louis Botwinik, vice president, Botwinik Brothers, Inc., to the first vice presidency, and Samuel Morey, president, Morey Machinery Co., to the second vice presidency. Frank Daley, treasurer, Daley & Sibley, was elected treasurer. Directors elected were George Shuman, J. Lee Hackett, Myron Segal, Ralph Hochmon, Max Leach, Harvey Goldman, George Bernstein, C. L. McDonald, Harold Blumberg, Sam Given, Joseph T. Weiss, Joseph Beal, Joseph Duff and Sam Danits.

Wartime Washington

Will Delay Enactment

Legislation on contract termination and disposal of government surpluses seems now rather certain not to go on the statute books for some months. This is not because Congress does not want to act upon these matters but because of the press of other legislative work, and the political conventions and subsequent campaigning, which is expected to entail a recess of some proportions.

By the end of June, Congress must approve about 15 appropriation bills, for the federal fiscal year ends June 30. With one third of the month gone, most of those which were not in conference committee still had one of the two houses to pass. On some of the bills, disagreement was so earnest that conference reports were bobbing back and forth between the two houses like tennis balls.

Against Summer Session

There will hardly be any real Congressional activity during the weeks when the two parties convene to select their presidential candidates, and despite the brave talk of some Republican Congressional leaders that Congress should stick to its guns during the summer to be ready immediately for any crisis, most House members will feel that hardly any crisis is apt to appear which would be more important than fence-building back home for re-election. One of the most politically-plausible reasons for staying in session—to be on the job when the invasion started—has already been exploded. As a practical matter, Congress can recess in such fashion that it could be re-assembled on a few days notice by its leaders if anything which demands it should transpire.

It Amounts Up

When the House gets down to serious business on S.1718, the George-Murray contract termination bill, it either will have to reject several last-minute changes wrought in the Senate version by the House Judiciary committee or it will have to resign itself to a conference committee on the two versions. It would require at least a week for a conference committee on the bill to reach an agreement and steer it through each house. A week does not seem very long, but a week on S.1718, a week for the GOP convention, a week for the Democratic convention and a minimum of two weeks to clean up unapproved appropriation bills add up to a sizeable period of time.

Changes May Delay

The House Judiciary committee changed the Senate's version of the George-Murray termination bill in two important respects. It inserted a simplified appeals procedure and provided for accounting standards to guide procurement officers and contractors. Further delay could arise in a fight over the extent to which the Comptroller General, Congress' watchdog, shall be allowed to delve into contract settlements and determine whether fraud was perpetrated.

Disposal Acts Lag

Legislation of surplus disposal is considerably behind the termination program. Numerous bills have been introduced on the subject, but it is generally expected that Congress will await the presentation of recommendations by Surplus War Property Administrator Will Clayton before getting down to concrete preparation of a bill. Clayton, it was understood, planned to have his "blueprint" before Congress by Mid-June. Thus far, he has been studying the problems of surplus disposal, preparatory to reporting on legislation as suggested in the Baruch-Hancock report which led to establishment of SWPA.

Plan Needs Study

How successful War Manpower Commission's latest program will be in moving workers from areas of easy labor supply into areas of labor shortage is a question which is not to be decided merely by program study.

Under the plan, all male labor in the United States will, after July 1, be hired solely on a "priority referral" basis, through the United States Employment Service or a similar agency which has USES' approval. Workers will be referred to the most urgent war jobs open at the time of application. Thus, if a foundryman living in an easy labor market were to apply for work, he would unquestionably be referred to a foundry engaged in turning out castings for the heavy truck program, which is expected to be one of the tightest and most important programs carried on this summer.

Local Conditions to Govern

The whole question revolves around the insistence USES or other approved hiring agency puts on its referral. If the foundryman is convinced that he won't work at all unless he works at the job suggested by USES, the difficult problem of how to get labor from one area to another will be on the way to solution. As outlined and explained by WMC people, however, the referral won't be so strict, and workers who refuse the most important job offered them will be offered another and another, in descending order of importance. Some semi-official indications are that almost any plausible reason will be accepted for refusal to move away from an established home. The plan will be applied with varying rigidity, depending on local conditions in the area. In question, is an indication that those workers who are determined not to move will not have to overcome a rigid national policy to have their way. Moving labor from one area to another has been one of the bigger manpower headaches of the war.

Charming Checkers — Women engineers who attended a nine-month intensive engineer course at Carnegie Institute of Technology, sponsored by the Westinghouse Electric and Mfg. Co., are shown making a test on a steel rod as part of their final laboratory work at the school. They are among the 33 women who completed the training and who are being assigned to Westinghouse laboratories as engineering assistants

Arctic Tester—A small tractor and a large fuel servicing truck emerge from the new refrigerator built by the York Corp. at Wright Field, after being put "on ice" to test Air Force equipment in arctic weather. The 80 ft. cold room goes lower than —90 F. and has 16 in. 4½ ton doors

CIO Union Mergers Seen as Step Toward Strengthening for Postwar

PITTSBURGH—The decision of the steel and the aluminum workers unions of the CIO to merge is believed to be the tipoff on tentative plans to form a giant basic metal industries union, which eventually would include all CIO unions engaged in the brass, copper, lead and tin industries.

The Aluminum Workers of America voted this month at the organization's biennial convention in Hot Springs, Ark., to amalgamate with the CIO United Steelworkers of America, which at its convention last month approved such a merger.

Another merger reported under discussion is the CIO Mine, Mill and Smelter Workers' Union, which has more than 80,000 members.

CIO Unification Proposed

A unified metals union may be the forerunner of a radical change in the CIO's organizational structure, with its 42 international and other affiliates perhaps being consolidated into six or eight strong units. Such major unions as the United Auto Workers, the United Rubber Workers, and the United Electrical, Radio and Machine Workers might absorb minor unions in allied activities. Perhaps a "catch-all" union would combine miscellaneous units which would not fit elsewhere.

This possible tightening of the CIO structural system would strengthen the unions, especially the smaller ones, for any postwar fights to hold labor's gains won in recent years. Jurisdictional conflicts between CIO units and duplication of organizational activity would be eliminated. Campaigns in unorganized plants, or those where other unions hold bargaining rights, would be intensified through large organizing staffs and extensive financial resources.

Combination Has Power

Claiming 80,000 members in 45 locals, the aluminum union will combine forces with the steelworkers unit which has 800,000 active members and 200,000 more in the armed services. The steelworkers have bargaining rights at two aluminum plants, the United Auto Workers at two, and the Mine, Mill and Smelter Workers at three.

The objectives of the merger are to enroll the 100,000 unorganized workers eligible for membership in the consolidated group, and to drive the American Federation of Labor out of the aluminum industry, CIO leaders said. The 50,000 unorganized Canadian aluminum workers also will be the object of organizational drives, union leaders have indicated.

Carnegie-Illinois Acquittal May Cause Suit Withdrawals

PITTSBURGH—The government's loss of the first round in its prosecution of Carnegie-Illinois Steel Corp. in the famous "faked" steelplate tests may result in other court actions against the corporation being dropped. After a three weeks' trial in federal court at Pittsburgh, the corporation was acquitted on charges of destruction and falsification of test records of steel shipped from the firm's Irvin Works to the Navy, maritime commission and Treasury Department between Jan. 1, 1942 and March 16, 1943. It was charged records of the tests were changed to meet government specifications.

Charged with Concealing Facts

A government civil suit for damages and a third indictment charging the corporation and Lawrence S. Dahl, Irvin Works superintendent, with conspiracy to conceal facts of the tests are pending. But the government may decide it has had enough of the case and these actions may never come to trial. Also hanging fire is a citizen's informer's damage suit filed by Herman M. Cogan, a Chicago attorney. The corporation was hailed into court after the Truman senate committee got a lot of publicity by exposing the purported faked tests.

At the trial, several corporation employes, called as government witnesses, testified to using the letter "F", indicating fake, in estimating chemical analyses of certain heats, or batches, of steel, to fit specifications when the identifying heat numbers were lost. The employees also told of dumping records of these tests into wastebaskets after Truman investigators appeared.

The theme of the corporation's defense was that if its employees made mistakes in identifying steel, they were honest and "human" errors committed under pressure of war-created demand for steel, and that the government had produced no testimony to show that anyone had lost a dollar or that a ship failed because of alleged subspecification steel.

Pittsburgh Area Will Need $25,000,000 in Machine Tools

PITTSBURGH—The expansion of the artillery and shell program, reflecting changing requirements on the battle fronts, has brought $100,000,000 of new war contracts from the Army to the Pittsburgh district in about a two-months-period, and the Pittsburgh area was selected to turn out more than 50 percent of the entire program.

To accomplish the job, it is estimated that $25,000,000 of new machine tools will be required for local plants. This is about equal in dollar value to all the new machine tools installed for war purposes in the Pittsburgh ordnance district from the start of the defense program in 1940 to the present.

Spotting the Air News

More Than Meets the Eye

Several secret weapons are being used by Anglo-American forces in their invasion of Europe. By far the greater proportion of these unpublicized devices are in aviation, particularly in the air-borne (parachute and glider) commands. These branches specialize in surprise tactics. It takes a long time to develop and test effective new weapons. The Germans worked at it successfully for years before the war. Now the Allies have gone through their development period and are evening the score. The new weapons will be revealed now and then as the enemy gets possession of them.

Less Miles, More Havoc

Despite design changes and persistent manpower problems the aircraft industry produced 8,902 units in May, a mark which was exceeded only once before—9,118 last March. More important, new records were set in all three heavy bombers: Boeing's B-17 and B-29 and Consolidated's B-24. The heavies are urgently needed to hit German installations which have been moved back beyond effective reach of Allied air attack. The new American bombing shuttle run over Naziland, with termini in Russia, makes the bombers much more effective. Planes have been reaching all enemy objectives for months but with explosive loads limited by fuel requirements. No matter how efficient a bomber is, shortening its run enables it to carry more bombs. This applies equally to the new B-29, which should be in action by the time you read this.

Double Weight per Unit

The units-to-pounds relationship is revealed in figures from the offices of Charles Wilson, chairman of the Aircraft Production Board, and T. P. Wright, director of the Aircraft Resources Control Office. Unit output increased 3,400 percent from January 1940 to March 1944, as compared with a weight increase of 6,800 percent in the same period. Average airframe weight increased from 3,600 pounds to 10,000 pounds in 1944. Carrying this rising weight of output, the industry still will produce close to 100,000 units, valued at $18,000,000,000 this year.

Right Under Their Noses

Since Dec. 7, 1941, the industry has delivered 171,257 planes having a total weight of 1,430,000,000 pounds. Britain has built 27,000 in the year ending March last, according to British Information Service. This output, at the rate of 2,250 per month, was nearly one third of the total 90,000 planes produced by Britain during five years of war, within easy reach of enemy air attack. Germany's maximum was 27,000 in 1942. This figure has been hammered down to about 20,000 or 1,700 per month. While German production is declining, Japan's rate is going up, from 1,000-1,200 per month, but probably it will never reach, or far exceed, 2,000 per month.

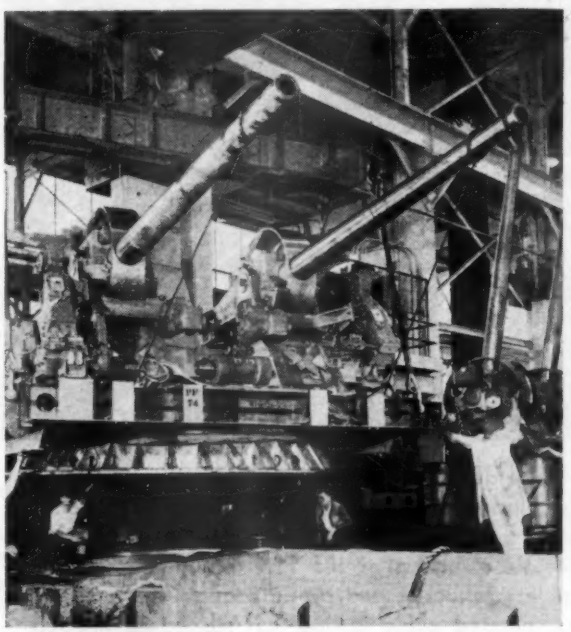
Five Grand—A veritable flying autograph sheet, the 5,000th Flying Fortress to be completed at Boeing Aircraft Company's Seattle plant since Pearl Harbor, is covered with the names of those who built her. Above, a riveting team completes one of the smaller parts

Cutbacks to Hit Inefficient

The inevitable cutback in aircraft production is in sight and the axe could fall any time, depending on invasion developments. The air forces want to standardize on fewer models; they want to make room in plants for new and improved designs; and they are simply getting nearly enough airplanes. When the Nazis buckle, there will be too many airplanes to take against Japan—perhaps not too many of just the right kind, but there will be more than enough capacity to produce the special types wanted. When all the talk of Navy's cancellation of the Brewster Corsair contract is boiled down, it was a cutback. The Navy has enough fighters in view and it picked out an inefficient plant to lop off. Same formula will be used in future, by both Army and Navy.

Grasshoppers Plague Enemy

Seldom heard of are the little 65 h.p. grasshopper liaison planes used by the Artillery to observe and correct their fire. Several thousand of them, nearly all built by Piper Aircraft of Lock Haven, Pa., are overseas, taking off from ordinary roads, flying up and down gulleys, hiding under trees. The military liaison type was converted, with slight change, from the pre-war puddle jumper which was becoming generally popular.



Double Death—Two 5 in. single-base mounted guns swing into place on the production line of the Westinghouse Electric & Mfg. Co. operated U. S. Naval Ordnance Plant, Louisville. Designed for both anti-aircraft and sea duty, guns of this type have turned creditable performances in Mediterranean and South Pacific campaigns; in the former they smashed enemy tanks six miles distant

Westinghouse Photo

Canadian Industry and Government Would Forestall Surplus Dumping

OTTAWA—Federal government officials share with Canadian manufacturers a fear that surplus United States war production equipment and war supplies may find their way into the dominion at fire-sale prices to the disturbance of established industry. Chief apprehension is that if machine tools and other manufacturing equipment should become available in the United States at very low prices—perhaps through its original sale to speculators who would resell where they could—some Canadians would be ready to buy with a view to setting up plants at low capital cost for chiseling into competitive manufacturing fields with the advantage of subnormal overhead, or, more likely, with the idea of compelling established firms to buy them out under threat of cut-throat competition.

Such a development would puncture Ottawa's policy of disposing of Canada's own surplus equipment and supplies in a manner to avoid damage to the industrial and business economy of the country. A definite disposal program on surplus war assets has not yet been adopted for Canada but when it is completed it will fully recognize the principle that these assets must not be distributed in a way to prejudice the position of industry to which Ottawa looks for the provision of maximum postwar employment.

May Restore Anti-Dumping Duties

To protect Canadian industry from an overflow of U. S. machinery and surplus products into the dominion, Ottawa officials are examining the advisability of restoring heavy anti-dumping duties; these were suspended in December, 1941, when price ceilings were imposed, in order to ease the profits squeeze on imported goods. Under the dumping duties law, surplus goods from the U. S. would be subject to valuation for tariff duty determined at whatever level customs authorities saw fit and which would be at levels designed to discourage importation of such goods. The dumping duties were suspended by cabinet order under authority of the War Measures Act and could be reinstated at any time by the same process without reference to parliament.

More fool-proof protection is believed to be in prospect, however, in the way of a two-way agreement between Washington and Ottawa to bar such transborder transactions in war products and equipment. It is thought that, with the war production program of the two countries closely coordinated, it would be only a logical step to coordinate such phases of reconversion as the disposal of surplus assets so that the policies of either country would not be prejudiced by anything done by the other. Canada's War Assets Corporation already has for disposal large quantities of machine tools and other plant equipment and will have much more as war contracts are terminated. It is argued that without safeguards against it some of these surplus stores might find their way into the United States to the injury of established American industries in the same way that U. S. surpluses in government hands are considered a threat to Canadian plants.

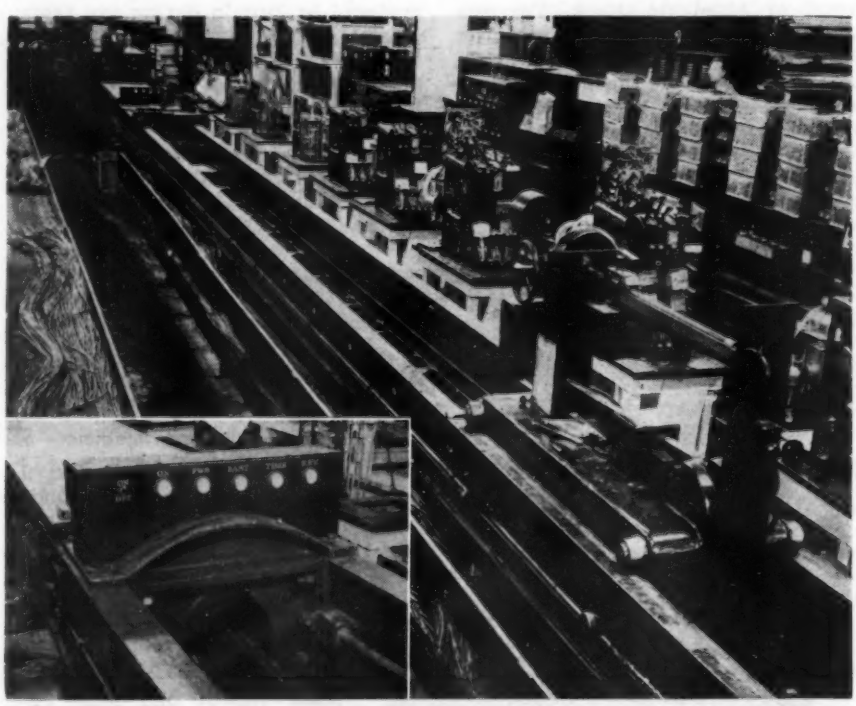
Civilian Goods Production Okayed, then Disapproved

OTTAWA—Canadian manufacturers of durable civilian goods, such as washing machines, refrigerators, vacuum cleaners, electric stoves, were given the green light by Ottawa control authorities at the first of the year for a small-scale production program as plant capacity was freed by war contract cutbacks. They were told that if they could find the raw materials they were free to make these goods, and Trade and Commerce Department took on the job of trying to get quantities of materials released with a view to token exports in preparation for postwar trade. Just as the plants were about ready to start, the program struck a hurdle in refusal by Washington to authorize supply from the U. S. of components required for all such products. As things turned out this was just as well because three months ago the light was switched to red when urgent orders came through for more and better invasion equipment and metals became scarcer than ever. Practically no durable household equipment was turned out with the exception of a few washing machines—these being allowed because shortage of domestic help had thrown a load on commercial laundries that they couldn't carry.

Now manufacturers are watching the progress of the invasion for an indication as to when they are likely to be allowed to resume the program.

WOMEN FOR MINES

OTTAWA—Canadian Labor Department has authorized the use of female workers in surface mining operations from which they have been barred. It will make regulations to safeguard their health.



Cable Test Speeder—A new device developed by employees of The Glenn L. Martin Co. makes it possible to test simultaneously as many as four control cables for proof load. Pilot lights on the indicator panel, inset, keep the operator fully informed of the progress of the test throughout the cycle, leaving him free to assemble turnbuckles and prepare additional cables for testing. This device has speeded cable testing, cut manpower needed

Names in the News

J. B. MacNeill

J. B. MacNeill, who started with Westinghouse Electric & Mfg. Co. in 1909, has been named manager of the switchgear and control division of the company. He succeeds **R. A. Neal,** who was recently elected vice president. Mr. MacNeill has been successively engineer, section engineer, manager of the circuit breaker engineering department, general manager of distribution engineering and manager of switchgear engineering.

W. F. Boyle has been named manager of gas turbine activities with the steam division of Westinghouse Electric & Mfg. Co. Mr. Boyle has been with the middle Atlantic sales district of Westinghouse since 1927 when he completed the company's graduate student training course. Prior to his new assignment, he was manager of the marine section of the steam division application department, and before that was manager of the division's sub-contracting department.

Wm. F. Boyle

C. T. Appleton

Clifford T. Appleton has been appointed manager of the machine division of Rolled Thread Die Co., Worcester, Mass. For the past seven years Mr. Appleton has been vice president of Leon J. Barrett Co., and prior to that he was associated with the Heald Machine Co. and Reed-Prentice Corp.

William F. Burditt, Sr. has been elected president of the Service Machine Co., Elizabeth, N. J., while **Paul Doxey,** former works manager of the Turbo Engineering Co., Trenton, N. J., has been named works manager of the Service Machine Co.

M. D. Bensley has been named manager of the three newly-acquired subsidiaries of H. K. Porter Co. of Pittsburgh, Pa.—the Mt. Vernon Car Manufacturing Co., the Wheel Foundry Div. of Mt. Vernon Car and the J. P. Devine Manufacturing Co. Mr. Bensley was associated with the Shenango Penn Mold Co. for 15 years in a sales capacity and later as assistant to the president.

Henry D. Engelsman, of the Metallizing Co. of America, Chicago, has been appointed sales manager and technical service supervisor of that company.

J. Nelson Kelly has been named executive vice president of the Fibre Lock-Nut Corp. Mr. Kelly has been connected with the aviation industry since 1917, when he was a pilot in World War I.

C. E. Parkhurst

A. E. Lindberg

O. R. Reller, production manager of Moline Tool Co., was elected vice president of the company recently. At the same time, **C. E. Parkhurst** was appointed chief engineer to replace **A. E. Lindberg,** who is retiring because of ill health after 34 years association with the company. **D. C. Eipper,** a member of the engineering staff of the Moline Tool Co. for the past 25 years, has assumed the position of assistant chief engineer.

O. R. Reller

D. C. Eipper

L. F. McGlincy

L. F. McGlincy, former assistant manager of operations in the Pittsburgh district for the American Steel & Wire Co., will succeed **E. H. Broden** as manager of operations in the same district. Mr. Broden has been with the Wire Co. for 48 years, while Mr. McGlincy has had 20 years of service, with seven months in his former position. Prior to that time, he had held numerous positions in the company with headquarters in Worcester, Cleveland and Donora, Pa.

Charles Gross has been named sales manager of the Murchey Machine and Tool Co., Detroit, Mich. Mr. Gross, for eight years general manager of auto trailer division—Evans Products Co., came to the Murchey Co. from Aeronautical Products, Inc. Detroit, where he has been assistant general sales manager.

Edward L. Miller has been appointed manager of engineering in charge of design engineering and research departments for American Machine & Metals, Inc., East Moline, Ill., to succeed **C. W. Anderson,** who was recently named vice president and general manager of the company's new subsidiary, U. S. Gauge Co., Sellersville, Pa.

V. N. Krivobok, formerly chief metallurgist at the Lockheed Aircraft Corp., Burbank, has become associated with the development and research division of The International Nickel Co., New York. Dr. Krivobok was at one time associated with the Carnegie Institute of Technology and the Allegheny Ludlum Steel Corp. The author of several papers on metals, he is also a member of several American, British, and Russian metal societies.

Frank K. Metzger

Frank K. Metzger has been elected vice president in charge of sales of the Baldwin Locomotive Works. Mr. Metzger has been with the Standard Steel Works Co., a subsidiary of Baldwin, since 1909. During that time, he has held successively positions as sales manager, vice president in charge of sales, vice president and general manager in charge of operations and sales. When Standard Steel became a division of the parent company, Mr. Metzger was named divisional vice president.

Leroy Camel

C. L. Kingsbury

C. L. Kingsbury, controller of the American Rolling Mill Co. since 1927, was elected director, vice president and general manager of the Rustless Iron & Steel Corp., Baltimore, Md. Rising from a machinist's apprentice for the Union Pacific Railroad, he was successively employed as a tool engineer and assembly shop foreman. Afterward, he became a test engineer for the General Electric Co. As a captain in the Ordnance Department, during World War I, he supervised various shops manufacturing guns.

Leroy Camel, previously manager of the eastern section of the Alkali Division of the Detrex Corp., Detroit, Mich., has been named sales manager of that division. **Joel Cooper,** Detroit, and **Herman Grosser,** Cleveland, have been named division managers in their respective territories.

BUSINESS ITEMS

The Cleveland Automatic Machine Co. has opened a new district office in Hartford, Conn. to handle part of the territory formerly covered by the Newark office. The office in Hartford is located at Room 529, Capitol National Bank Bldg., Hartford 1, Conn. The new office will be under the managership of **W. O. Aldrich,** while **R. T. Carroll** has been appointed district manager at the Newark office.

Herr-Harris Co., 545 William Penn Pl., Pittsburgh, Pa. has been appointed representative of the **Edward Valve & Mfg. Co.** in the Charleston and central West Virginia territory.

The production of electroplating equipment will be undertaken by the newly-formed **Industrial Hard Chromium Plating Equipment Co.** The plant of the new company is located at 13 Rome Street, Newark, N. J.

The Wain Engineering Co., Omaha, Neb. has become the distributor of the **Barber Colman Company's** control and air distribution products in the Omaha territory.

Hardinge Bros., Inc., Elmira, N. Y., have established an engineering and service office at 4460 Cass Ave., Detroit 1, Mich., which will be under the supervision of **Charles Boland.**

Selas Corp. of America has established a new district office at 916 S. Michigan Ave., Chicago 5, Ill., to serve the mid-western states.

The Universal Engineering Corp., Cedar Rapids, Iowa, has acquired the manufacturing rights, parts, stocks and current orders for the U-6 automatic and voulter types of thread milling machines formerly manufactured by the **Automatic Machinery Corp.** and the **Bolton Manufacturing Co.,** Bridgeport, Conn.

Oil Well Supply Co., a U. S. Steel subsidiary, has contracted to acquire **Witte Engine Works,** Kansas City, Mo. The Witte works will continue in its manufacture of small gas, gasoline and diesel engines for general use.

The **H. C. Hook Company,** 340 Main Street, Worcester 8, Mass., has opened offices to provide engineering service, act as manufacturer's representatives and deal with precision gages and production tools. The business is under the supervision of **Henry C. Hook** and **John Lindegren.**

Fork Lift Truck and Tractor Div. of the **Berry Motor Car Co.,** St. Louis, Mo. has been acquired by **Domestic Industries, Inc.** Key personalities of the Fork Lift unit will become associated with the Domestic division and the department will be moved to Albion, Mich.

The Struthers Wells Corporation has opened a new Buffalo office to replace the one discontinued three years ago and will cover the state as far as Albany, with branch offices in Rochester, Syracuse and Albany. The Buffalo office will be under the supervision of **Thomas F. Killeen.**

OBITUARIES

John B. Tytus, vice president of the American Rolling Mill Co. died suddenly June 2. Known throughout the iron and steel industry especially for his work in proving that it was possible to roll iron and steel sheets continuously, Mr. Tytus started as a member of an Armco hot mill crew. He was elected a vice president of Armco in 1927 and, in 1943, became vice president in charge of technical development.

John Geisel, former carriage manufacturer and builder of auto bodies, died recently at the age of 70.

J. Thomas Talbot, vice president and director of the Dominion Brake Shoe Co., Ltd.—an affiliate of the American Brake Shoe Co.—passed away at his home on June 6.

Louis M. Rossi, 67, passed away following a sudden illness. Mr. Rossi joined the Bakelite Corp. when it was formed in 1910 as works manager. In 1919 he was made general manager and in 1923 he was elected vice president and director of manufacturing, which position he retained until his death.

Arthur J. Brandt, production engineer died recently at the age of 56. Mr. Brandt was president of the National Tool Co., chief executive officer of the DI-Noc Manufacturing Co., and a board member of the Vultee Corp.

Willard T. Hatch, who retired as engineer of power and construction for the Brown & Sharpe Manufacturing Co., Providence, in 1924, died at his home on June 3. Mr. Hatch was in his 92nd year and was previously connected with the Putnam Machine Co., Fitchburg, Mass., the Atlas Engine Works, Indianapolis, Ind., and the Dayton Screw Co., Dayton, Ohio.

John W. Robb, vice president and treasurer of the A.C.F. Motors Co., a subsidiary of the Brill Corp., died recently after a brief illness.

John H. Murch, 61 year old manager of the equipment division of the American Can Co., New York, died suddenly on a train in Cincinnati. Mr. Murch was also assistant manager of the Amertorp Corp., a subsidiary of American Can.

MEETINGS

American Institute of Electrical Engineers. Summer Technical Meeting, Jefferson Hotel, St. Louis, Mo. June 26-30.

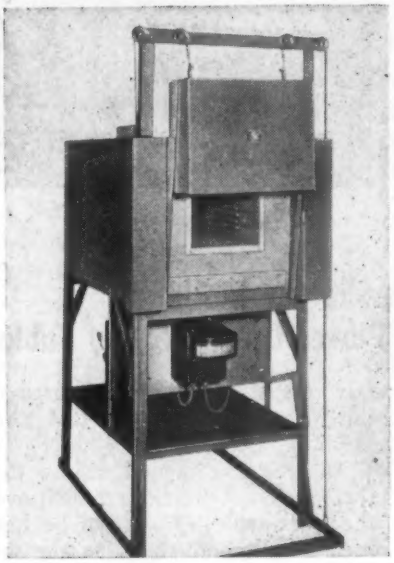
American Society for Testing Materials. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. June 26-30.

American Society of Mechanical Engineers. Semi-annual meeting. William Penn Hotel, Pittsburgh. June 19-22.

Silver Bay Association. Silver Bay Industrial Conference. Lake George, N. Y. July 26-29.

Society of Automotive Engineers National Transportation & Maintenance Meeting. The Bellevue-Stratford, Philadelphia, Pa. June 28-29.

Shop Equipment News



Hupper Model 16 furnace

Huppert Electric Furnaces Available in Five Sizes

A new series of floor model electric furnaces is being marketed by K. H. Huppert Company, 6830 Cottage Grove Ave., Chicago 37, Ill. There are five basic designs each of which will have five or more variations, principally involving inside depth of the furnace.

The model 16 (illustrated) has work chamber dimensions of 12 in. wide, 8 in. high and 18 in. deep plus an 8-in. throat. Variations in this size include furnaces with depths of 24 and 36 in. The standard furnace consumes floor space of 35 × 46 × 6 ft. 10 in. high. The door is 21 in. wide, 17 in. high and 8 in. thick. Furnaces body is of 18 gage steel, reinforced at all corners.

These furnaces are operated on 220 volts, single- or three-phase, and can be furnished to operate on 440 volts three-phase. Current consumption of the Model 16 is 9 kw. They have a maximum continuous operating temperature of 1,850 F., but provide 1,950 F. for intermittent use.

Standard equipment includes a No. 221 Wheelco Capacitrol, 1 Chromel-Alumel thermo-couple, magnetic contractor and all other necessary electrical equipment, connected, with the furnace usable upon delivery.

Monarch Shape Master Lathe Does Turning, Boring, Facing To Nearly Any Desired Shape on Work to 16-in. Diameter

Turning, boring or facing in almost any desired shape on work up to 16 in. diameter is possible on the Shape Master, shape-turning lathe being manufactured by Monarch Machine Tool Company, Sidney Ohio. It is capable of doing intricate shaping and forming work. This model contains refinements over a machine introduced prior to the war.

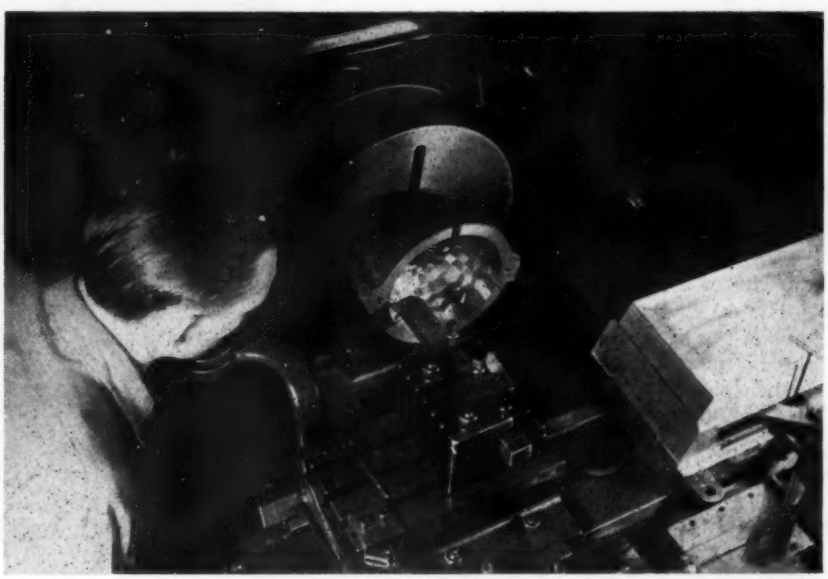
As an example of the work possible, is an oval dish mold, with as many 16 flutes, which can be machined completely from rough to finish in 2¼ hr. The original mold can be duplicated exactly, as many times as may be necessary.

The Shape Master mechanism consists of three elements. One controls the shape cut; another the rate of repetition of the shape on any given circumference, and a third that controls the contour generated on successive diameters. The tool-actuating mechanism is cam operated and is mounted on the carriage crossbridge in place of the usual compound rest. A cam follower is linked to the movable tool carrier, which rests on anti-friction bearings, and guides the tool in a shaper-like stroke.

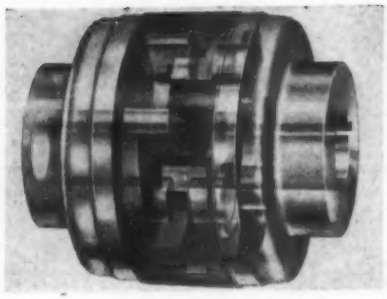
The master cam records only a single element or unit of the desired design or pattern, whether oval, triangle, square, hexagon or a non-geometric shape. Repetition of the shape to be cut is determined by the geared relationship of cam and spindle revolutions. A single motor powers both, and the machine has been provided with sufficient change gears to give a range up to 500 shapes or tool actuations per revolution of the work.

Shape generation is simplified in that the machine makes its own master record cams. A simple, motor-driven cutting head can be substituted for the cam follower. When this is done an enlarged template of the section desired is chucked and a stylus substituted for the tool. The chuck is slowly rotated and the machine literally works in reverse to cut its own cam.

A stroke-compensating device makes it possible to maintain the same shape over a constantly increasing or decreasing diameter of work piece. Irregular contours can be obtained by the use of a metal template in conjunction with the Keller controls.



Monarch Shape Master tool-actuating mechanism



Automatic Multiflex coupling

Automatic Machine Introduces Multiflex Flexible Couplings

A line of shock absorbing flexible couplings is now available from Automatic Machine and Tool Company, 132 Charles St., Auburndale, Mass. Termed Multiflex couplings, they are available in eleven sizes with horse power ratings ranging from 0.15 to 0.60, at 100 r.p.m. These couplings, designed to compensate for angular and parallel misalignment, are cushioned in water and oil-resistant rubber and require no lubrication.

Hyster 75 lift truck

Hyster 75 Lift Truck Can Turn in Its Own Length

A working speed of up to 12 m.p.h., forward or backward, is provided on the Hyster 75 lift truck being produced by Willamette Hyster Company, Portland, Ore. It can turn in its own length of 117 in., has an overall width of 60 in. and a capacity of 7,500 lb.

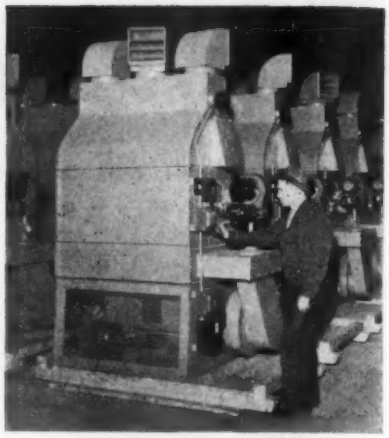
Hyster 75 has conventional automobile controls and operates on three large pneumatic tires. It is said to be able to go anywhere, from a standpoint of tractive effort, that an automobile truck can and will climb comparable inclines.

On standard models, the height of lift is 108 in. from the ground to the underside of the load, but this distance can be varied on special equipment to adapt the unit as needed.

Dravo Offers Small Model Of Direct Fired Heaters

For heating small structures and providing additional heat to limited areas, Dravo Corporation, 300 Penn Ave., Pittsburgh, Pa., has made available a small model of the Dravo direct fired heater with capacities ranging from 300,000 to 850,000 Btu output per hour. Floor space requirements are 5¼ × 3 ft., although it can be suspended from the wall when no floor space is available.

This model can be equipped to burn either gas or oil, with burners interchangeable. The heater is thermostatically controlled.

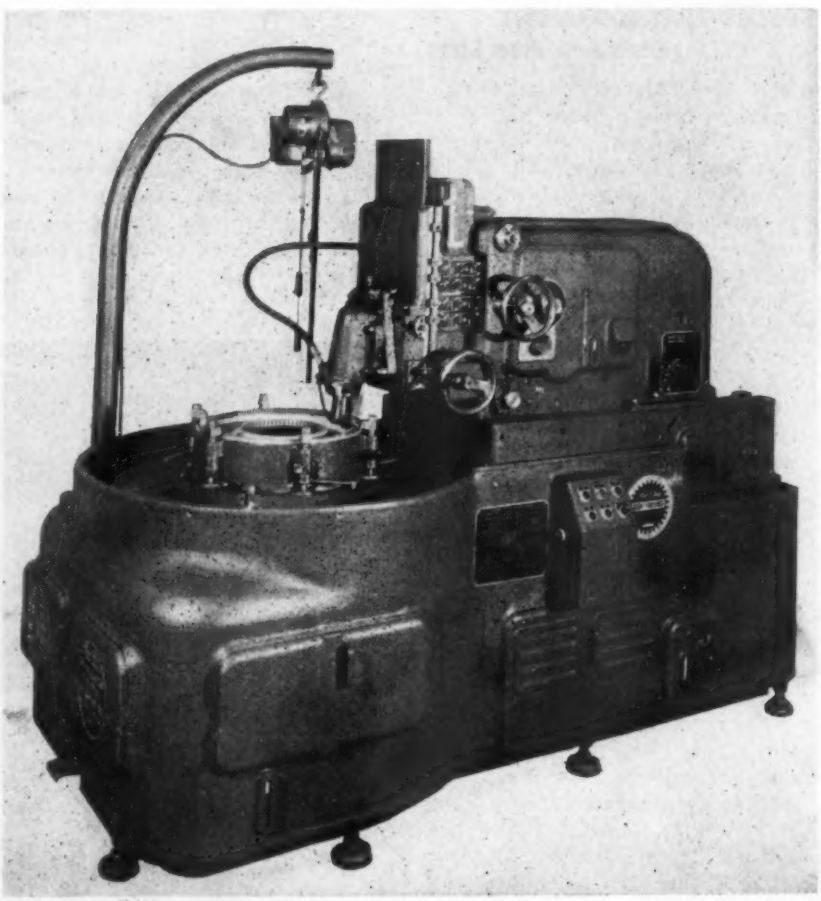


Dravo direct fired heater

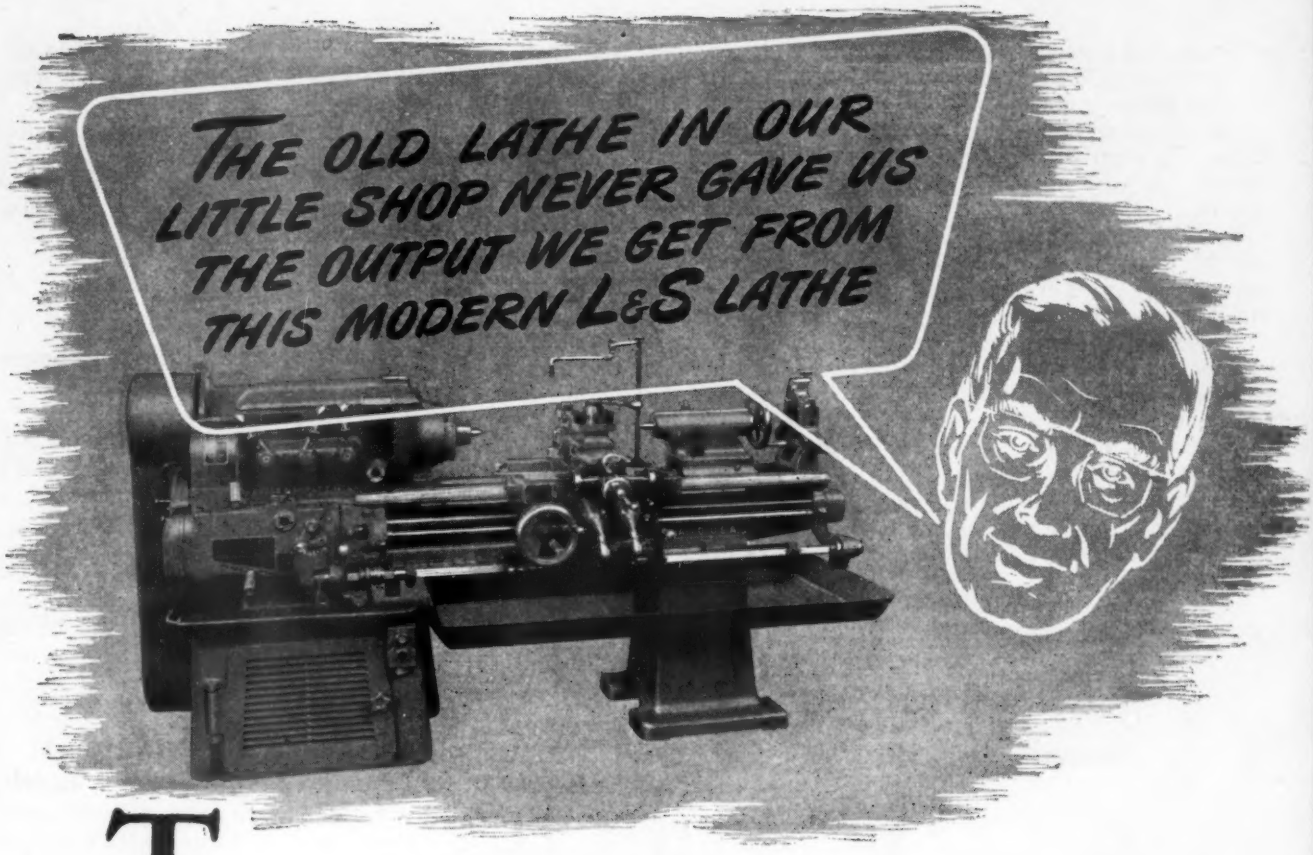
National Red Ring Gear Tooth Shaving Machine Carries Work on a Power-Driven Rotary Table

Work is carried horizontally on a power driven rotary work table in the GCQ-36-in. gear tooth shaving machine newly announced by National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich. The machine is for finishing of both internal and external gears with from 12 to 36 in. pitch diameter. The principle of rotary crossed axes shaving is used in this machine, as in other Red Ring finishing machines.

The machine is designed so that there are no obstructions directly over the work table. Work can be lowered directly onto the table, the surface of which is at a convenient height. To further facilitate loading



Red Ring GCQ-36-in. gear shaving machine



THE lathes in your shop may be only a few years old—yet may be as worn or obsolete as machines of half a century ago. For in many shops today, the terrific strain of continuous war production has reduced the economic life of a lathe to a fraction of its original capacity. With greater production still the objective in nearly every plant, lathes incapable of top performance should be replaced with new and improved models.

If the lathes in your shop were purchased before the war, check them with the new, more versatile and productive lathes Lodge & Shipley offers. These powerful, high-efficiency tools will give your work the benefit of every worthwhile improvement devised in 52 years of specialized lathe experience. For a practical demonstration of how an L & S Lathe pays for itself in increased production and lowered costs, call on Lodge & Shipley Engineers.

PREPARE FOR THE COMING BATTLE OF MARKETS!

In the postwar period, lower costs will be more than ever a determining factor in the salability of your products. This L & S Manufacturing Lathe, for example, will reduce your production costs on a wide variety of work. In addition to having all the features of an engine lathe, it performs many other types of work, rivals an automatic in output and accuracy. Various automatic and manual controls simplify tasks of the operator, effecting unusual time savings on both production and single-piece jobs. For complete details on various L & S Manufacturing Lathes write for Bulletin No. 615 MO.

ENGINE
AUTOMATIC
TOOL ROOM
OIL COUNTRY
LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.

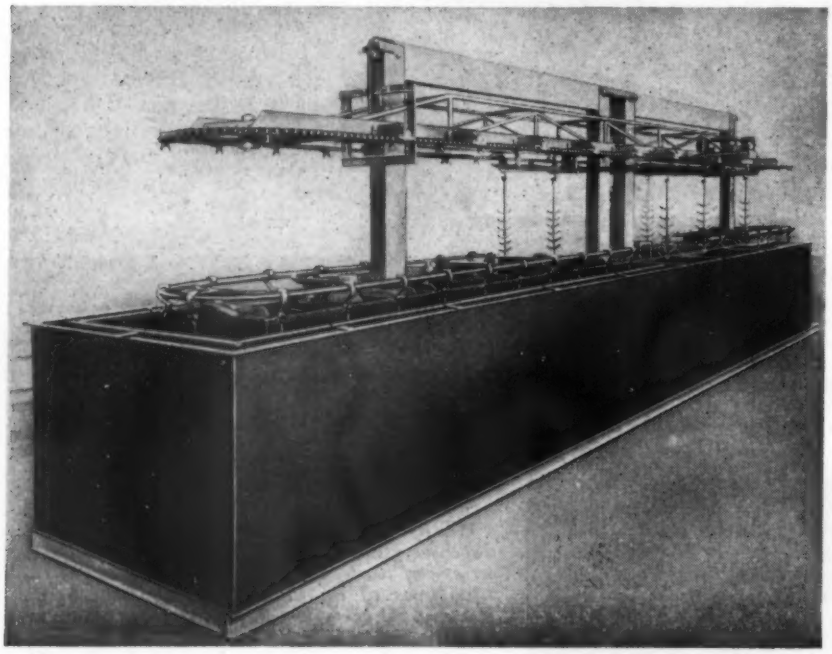
CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

of heavy, bulky work, a power hoist is offered as optional equipment. It is a free-swinging jib crane mounted on the machine base, having a 500-lb. capacity electric hoist that may be brought directly over the table's center.

Essential elements of the finisher are the rotary table, on which the work gear is carried in a quick clamping fixture, and a horizontal feed slide, which carries on its forward end the cutter head with its vertical crossfeed slide. The horizontal slide feeds the cutter into the work, and the vertical slide reciprocates the cutter across face of the work.

In operation, the cutter is placed in mesh with upper ends of work gear teeth before the machine is started. As cutter and work rotate, the cutter head moves downward at a rate of between 0.004 and 0.016 in., as selected, per work gear revolution. On reaching the lower end of the stroke, table rotation is reversed, cutter is fed one increment into the work gear, and the cutter head starts its upward stroke. Completely automatic, the same action takes place when the cutter head reaches the top of its stroke. After cutting strokes are completed, in-feed is disengaged and the machine idles through one or more additional strokes to assure maximum smoothness of tooth surfaces. At the end of the idling strokes, the machine automatically stops for unloading. Limit-switches prevent over-travel.



Udylite packaged fully automatic plater

Udylite Offers Packaged Fully Automatic Plating Machine Which is Rated to Handle Up to 76 Work Racks Per Hour

As a result of a survey which revealed that 80 percent of all electroplated parts could be handled more efficiently and economically on a fully automatic plating machine, Udylite Corporation, 1651 E. Grand Blvd., Detroit 11, Mich., has developed a full automatic plater which can be sold as a package. Features of the machine vary little from those incorporated in special machines built by the company during the past few years, with a few notable exceptions.

A square type transfer system was designed, which requires less space and permits a wide variation of transfer speeds—lift, transfer and lowering rate being independently variable. Racks are spaced on 18-in. centers, but this distance may be varied without readjustment of the transfer mechanism. The machine uses a single row carrier system and handles up to 76 racks per hour.

Positive transfer is achieved through a single, hydraulic mechanism. The welded steel superstructure is carefully counterbalanced so that transfer mechanism lifts weight of only eight loaded racks at one time. Heavy duty, copper anode and cathode rods afford self-aligning hook contact.

The machines may be used in multiple units or batteries to meet job requirements, and quickly converted to individual use when the need of a battery no longer exists.

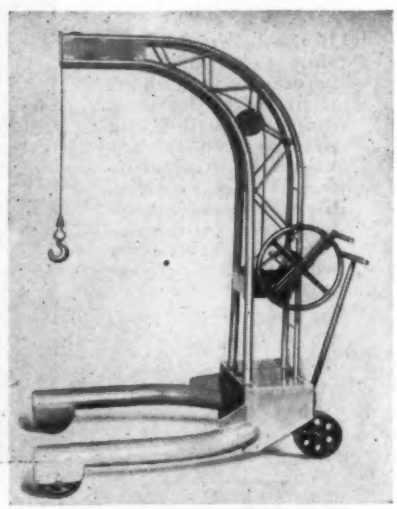
Scherr Adds Four Midgets to Line of Adjustable Snap Gages

The George Scherr Company, 128 Lafayette St., New York 13, N. Y., has added four models of adjustable limit snap gages. The new additions to the line are known as midget type gages. They are manufactured in accordance with American gage design standards and are designed for inspecting extremely small and delicate parts. The midget gages can be set to handle work 0.000 to 0.760 in.

Canton Portable Crane Weight Half That of Previous Models

A new line of Canton portable cranes for handling loads where overhead lifting equipment is not available is announced by the Hill Acme Co., 8400 Breakwater Ave., N. W., Cleveland 2, Ohio. Made of welded steel, the Canton cranes now weigh less than half as much as previous models.

Two-speed operation is provided by means of a single or double cable,



Canton portable crane

for light or heavy loads. Adjustable extension handle gives additional leverage, and self-locking worm mechanism holds the load at any point. The crane is avialable in all models of one- to three-ton capacity.

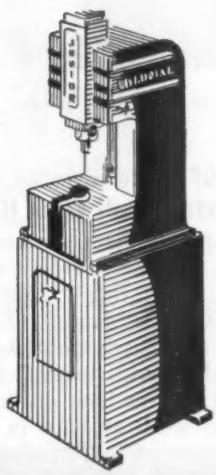
Announcing... New JUNIOR PRESSES by Colonial

For light duty broaching or for assembling where pressures up to 4 tons are required, or for light duty straightening, etc., there is no better press than Colonial's new all hydraulic line of "JUNIORS".

Available either in bench or pedestal types and for either push or pull broaching (with special attachment). Capacities from one to four tons. Machined and counterbored platen for easy installation and location of fixtures. Plenty of daylight and clearance. Compact, powerful and sturdy. Remarkably low in cost when you consider the tremendous variety of jobs these presses can do.

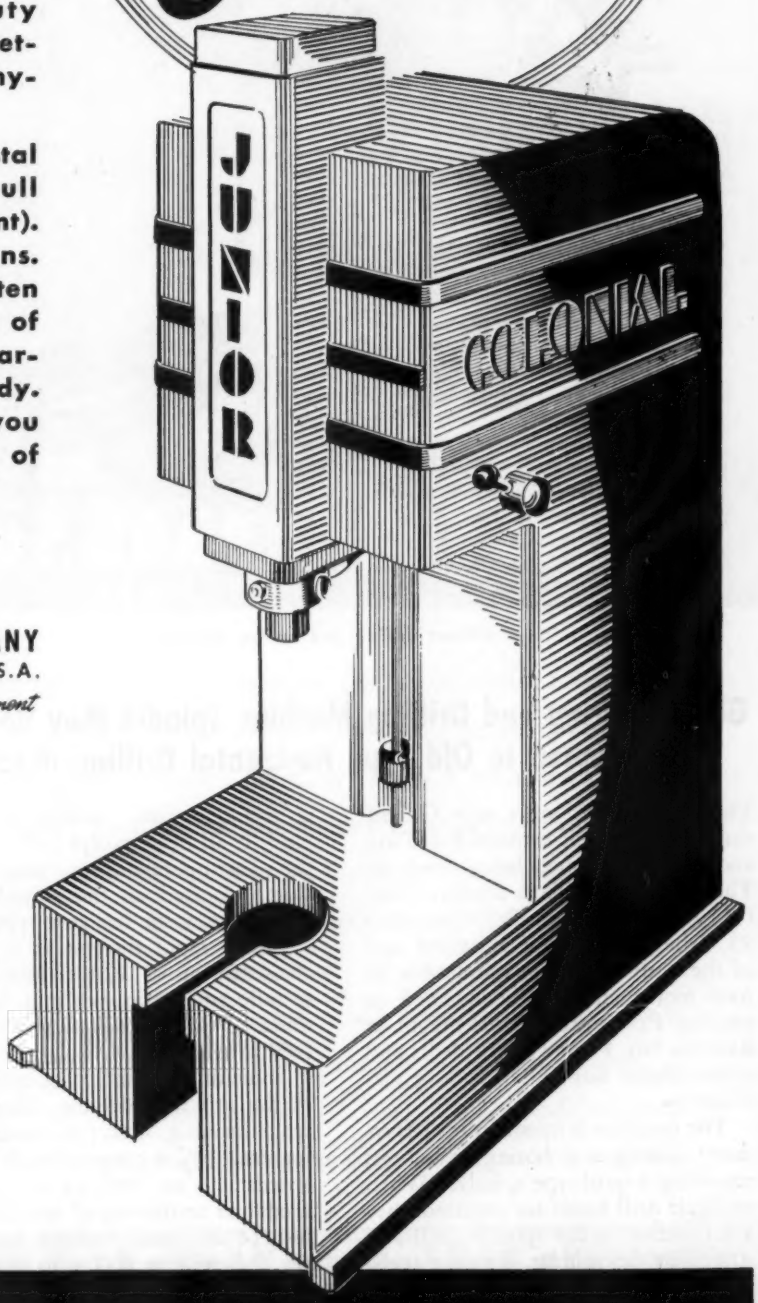
For complete technical data write for Bulletin No. VJI-44

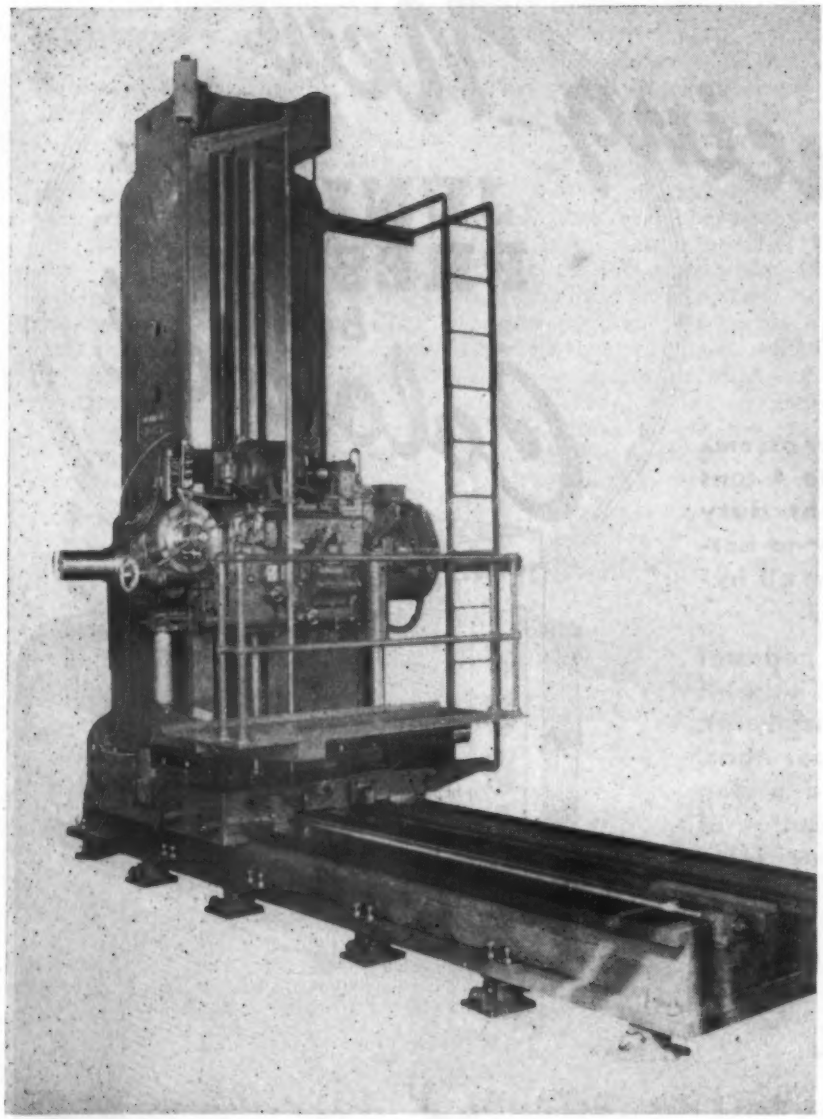
colonial BROACH COMPANY
DETROIT 13, U.S.A.
Broaches · Broaching Machines · Broaching Equipment



***Right*–Bench type all-hydraulic Junior Press. Also available with variable speed and pressure controls and pressure gage.**

Left **– Pedestal type Junior for press work or broaching. Also available, equipped for pull broaching.**





Gilbert drilling and boring machine

Gilbert Boring and Drilling Machine Spindle May Be Adapted to Old Type Horizontal Drilling Machines

The spindle head of a new Gilbert single spindle self-contained drilling and boring machine, being made by The Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio, is also self-contained and of the quill-type. The spindle has its own motor and can be adapted to existing Pawling & Harnischfeger or Ryerson No. 11 or No. 12 drills and other similar horizontal drilling machines.

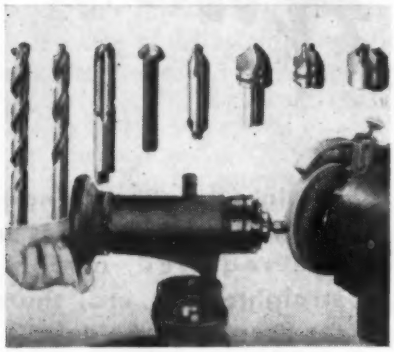
The machine is intended for heavy-duty drilling and boring operations requiring a quill-type spindle. When multiple drill heads are required, they are fastened to the spindle quill and driven by the spindle. Spindle speed mechanism provides 24 speeds, with only four sets of gears being meshed at any one time. Sliding gears are used in all cases except for clutching the herringbone face gear. This clutch, located on the spindle driving sleeve, is of the gear type.

Power rapid traverse is at a constant rate of 42 in. per min. to the spindle and 70 in. per min. to other units. Traverse is interlocked with feed mechanism.

Some of the principal specifications of the spindle head are: diameter in front bushing, 4 in.; diameter, driving end, 3½ in.; taper, No. 6 Morse; speeds 12 to 700 r.p.m.; milling feeds per revolution of spindle 0.005 to 214 in., and drilling feeds per rev. of spindle 0.003 to 0.128 in. The spindle head is available with travel of 60, 72, 84 or 96 in.

I-G-C Relief Grinding Fixture For Drills, Taps, Countersinks

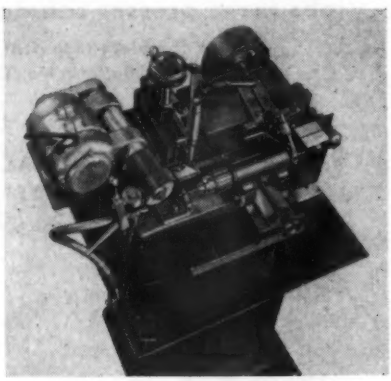
Accurate Machine Products Company, 1640 S. Hobart Blvd., Los Angeles 6, Calif., is marketing the I-G-C relief grinding fixture. Originally designed for ginding counter-



I-G-C relief grinding fixture

sinks, it is now found to be equally suitable for drills and taps.

It will take work from 1/16 to 1 in. in diameter and any number of flutes to 12 with the exception of 5, 7 and 10. It fits any standard grinding machine and works with either right- or left-hand taps and cutters without additional attachments.

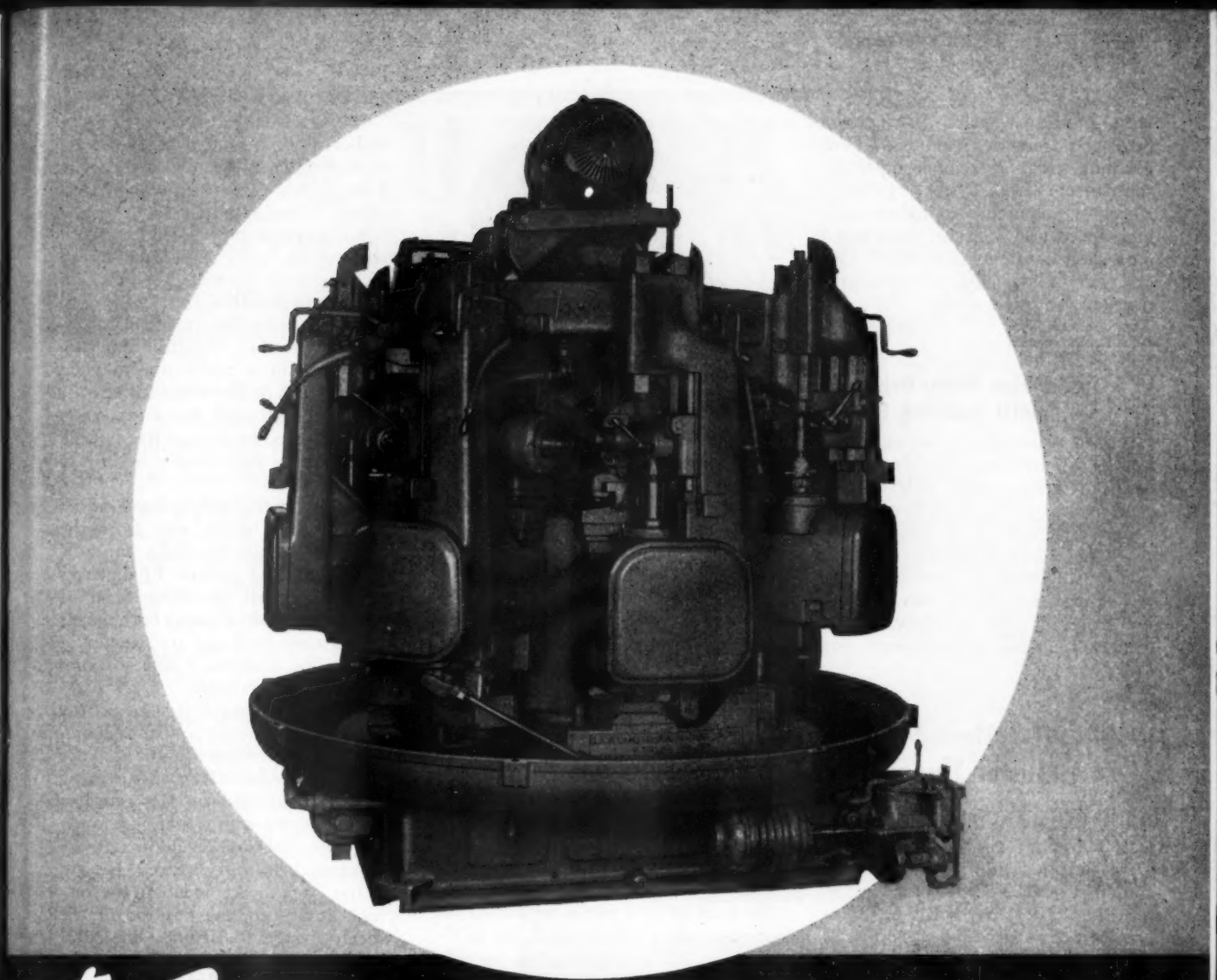


Wardwell universal flute grinder

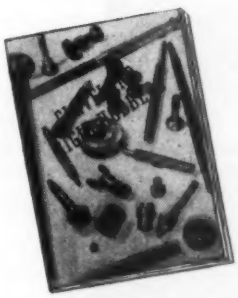
Wardwell 50F Flute Grinder Has An Extra Small Work Unit

The No. 50F automatic universal flute grinder, available from The Wardwell Manufacturing Company, 3167 Fulton Rd., Cleveland 9, Ohio, will grind straight and spiral flutes from the solid in small reamers and taps. In range, the machine will handle reamers as small as 1/16 in. in diameter and saws up to 8 in. diameter and spacing from 2 flutes to 20 teeth per in.

The standard machine has a long,



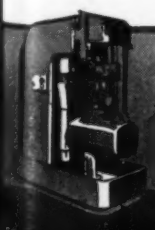
The Rotary RIGIDHOBBER



THIS BOOKLET tells all about hobbing—the simplicity of the Rigidhobber—its advantages from standpoint of duplicate accuracy—speed—and production costs.

Write for your copy today.

● Designed for high production of precision gears and splines . . . Eight operations are performed simultaneously . . . Eight finished pieces at every complete cycle . . . Operations on each of the 8 spindles are performed independently of each other during continuous rotation of the 8 spindles on the machine base . . . Different hobbing operations on gears and splined shafts can be performed simultaneously . . . Operator merely loads and unloads the piece at loading station—all operations on the work are fully automatic . . . Work is supported both above and below hob during operation assuring close accuracy and absolute duplication . . . Machine handles work up to 6" diameter and 13" long. Consult a Cleveland Hobbing Engineer on the precision hobbing of your gears and splines.



The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

large grinding wheel spindle, driven by V-belt from the main shaft. For grinding spiral work, or in other circumstances where a small grinding wheel is required, an independent high speed grinding unit is arranged on a shelf of the vertical slide. This unit can be swiveled to any degree required for spiral work.

U. S. Tool Makes Motor-Driven Automatic Indexing Fixture

Designed primarily for use on Maximillers of its own manufacture, a motor-driven automatic indexing fixture made by the U.S. Tool Company, Ampere, N. J., can be used on any standard type milling machine. It is a completely self-contained unit.

The unit is available with different index plates to give a wide variety of degrees of index. For instance, one

U.S. indexing fixture

index plate will give the following number of stations: 3, 4, 6, 8, 9, 12, 18, 24, 36 or 72, while another would give 3, 4, 5, 6, 10, 12, 151, 20, 30 or 60 stations. The first plate would have 72 notches and the second, 60. Oxerall size is 19⅞ × 11 49/64 in.

The work table is traversed by a leadscrew that is driven from the work spindle by change gears. The grinding wheel carriage remains stationary during grinding.

Approximate position of the work table is set with a pointer to an auxiliary scale graduated in 0.01 in. A handwheel with a drum reading to 0.0005 in. provides for fine adjustment of the table, to permit centering the wheel in a previously roughed thread. Feed of the wheel toward the work is controlled by a precision screw actuated by a large handwheel. A micrometer stop permits settings to 0.00005 in.

The external grinding head can be tilted 15 deg. either way from the horizontal to suit the helix angle of the thread being ground. Changeover to the external grinding head is quickly effected, because both heads are self-contained, and are retained in position by a dovetail and V-clamp tightened by two bolts.

A single diamond is used in the external truing device so that diamond wear has no influence upon accuracy of thread profile. The wheel truing device is mounted on the carriage, which is fitted with a dial gage upon which the operator reads directly the reduction in wheel radius. Using a similar gage at the front of the machine, indicating the position of the wheel carriage, he advances the latter by an equal amount to compensate for wheel wear through dressing.

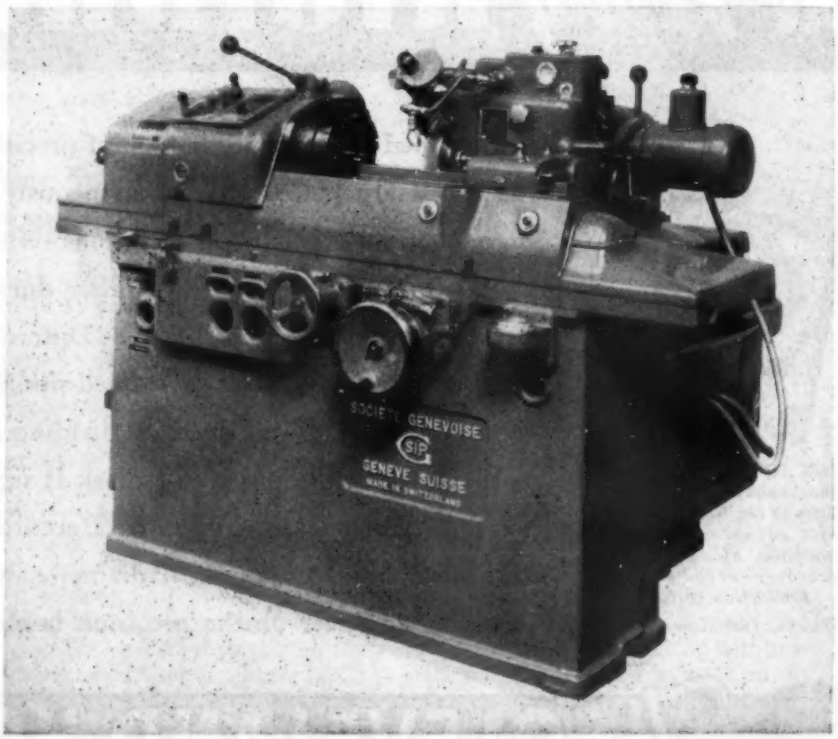
"SIP" RU-2 Thread Grinder Is Intended for Grinding Master Thread Gages Without Subsequent Lapping

For production of the highest-quality master thread gages without lapping, Cosa Corporation, 5000-4 Chrysler Building, New York, is now supplying the "SIP" Type RU-2 thread grinder. The machine is built by Societe Genevoise D'Instruments de Physique, Geneva, Switzerland, and deliveries are being made to this country.

The "SIP" grinder is guaranteed to produce a lead accuracy of 0.00008 in. in a 1-in. length and 0.00016 for the full grinding range. Working range is 15¾ in. between centers; maximum length ground, 15¾ in.; maximum diameter for external grinding, 8¼ in.; maximum diameter for internal grinding, 7⅞ in., and pitches from 50 to 2 threads per inch. Floorspace occupied by the machine is 7 ft. 2 in. by 5 ft. 2 in., and the weight is 3750 lb. Sixteen headstock spindle speeds range from 0.6 to 12 r.p.m.

A 10-in. wheel is used to reduce inaccuracies through side motion. The wheel is always checked with a microscope before and after dressing. This is particularly valuable in the case of ring thread gages, and avoids making a cast of the internal thread.

High accuracy of thread pitch is said to result from a combination of these factors: First, the precision leadscrew is fitted with a correcting device that results in accurate displacement of the work table. An adjustable temperature compensator may be used to overcome the effects of room-temperature changes and the cooling effect of the coolant. Second, the leadscrew nut is connected to the bed with a sturdy universal joint. Third, the work table is partly supported on spring-loaded rollers which run in V-ways, so that a pull of a few pounds will keep the table in motion.

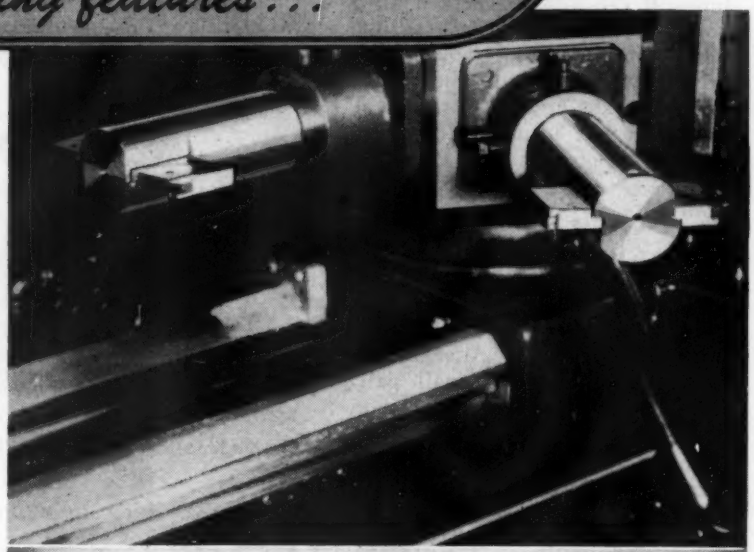


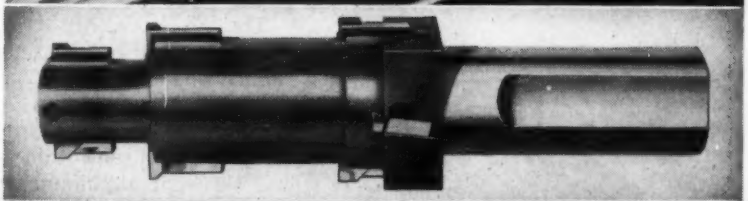
"SIP" RU-2 Thread Grinder

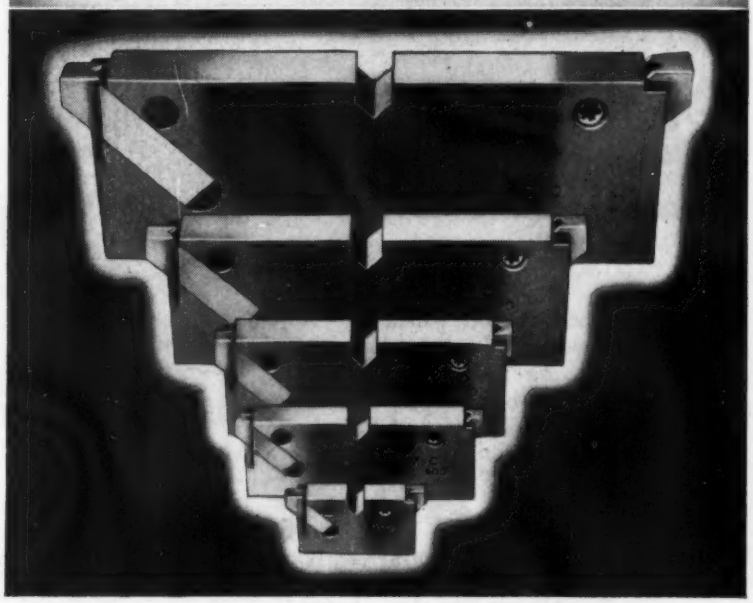
McCROSKY

BLOCK-TYPE ADJUSTABLE BORING BARS

present cost saving features . . .







● Production-Tested adjustable boring bars such as those shown in the accompanying illustrations can be the answer to many of your tooling requirements. Shown on the job are turret type straight shank bars, one of several types made by McCrosky for low cost boring operations. Other styles of Standard bars are turret type with taper shanks and piloted bars with both straight and tapered shanks.

Also illustrated is a special purpose bar designed by McCrosky Engineers, incorporating Standard McCrosky Blocks as shown in the bottom illustration for quick adjustments and ease of replacement.

Full range of cutting diameters available from 1" to 15" with Standard Adjustable Blocks made in five series.

ADVANTAGES

Centralizing "V" Lock for Accuracy
Blocks Changed Without Removing Centering Key
Separate Thrust Block
Hardened Cutter Blocks
Positive Blade Lock
Quick Adjustments
Eccentric Relief
Strength and Rigidity for effective use of Carbide Tipped Blades

DELIVERY

Deliveries on most sizes of Standard Adjustable High Speed Steel Blocks can now be made from stock — Carbide tipped adjustable blocks now being shipped from three to six weeks — Standard bars depending on size and quantity can be shipped from four to six weeks.

BULLETIN 16-B

gives full details of design and construction features and full instructions on operation. Write for your copy today.

OTHER McCROSKY PRODUCTS

SUPER Adjustable Reamers, JACK-LOCK Milling Cutters, Special Purpose Cutting Tools, WIZARD Quick-Change Chucks, Turret Tool Posts.

EST. 1904
McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Inspection of the thread profile for internal threads can be done by feeding the wheel into a piece of sheet iron fastened in a holder fixed to the ways. The profile thus produced is gaged on a support, using the standard measuring microscope of the machine. It can also be checked on a profile projector. By dual adjustments of the microscope, the master form is set adjacent to the profile silhouette. The angle is corrected if necessary by adjusting dividing drums on abutments of the trueing device.

Tivit Small Parts Cleaning Booth Has Many Applications

Tivit Products Company, 8024 South Vermont Ave., Los Angeles 44, Calif., is marketing a small parts cleaning booth for use on shop benches. It measures 20×20×15 in. deep.

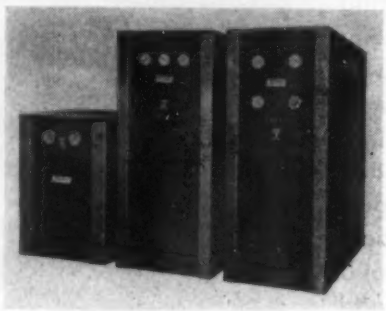
Parts to be cleaned in the booth are sprayed by a solvent and air mixture by means of a small gun, attached to the booth's front panel. A tank on one side of the boot contains a penetrating solution where parts can be soaked before spraying. Provision is made at the rear of the unit for an exhaust fan should one be needed or desired.

Tivit cleaning booth

Frostrode Refrigeration Units Have Higher Reserve Capacity

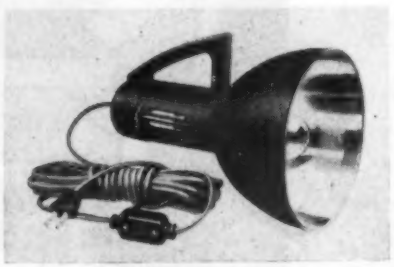
Among contributing improvements in the line of Frostrode industrial refrigeration units manufactured by Frostrode Products, 19003 John R, Detroit 3, Mich., is an improved evaporator coil arrangement. This refinement eliminates all sharp bends, minimizes back pressure of the refrigerant and permits unrestricted flow of coolant. This is said to increase reserve capacity of the units.

Improved refrigerant expansion valves have increased sensitivity to temperature variations, insuring closer control of coolant temperature through faster response. Other features include elimination of low pockets, where sediment might accumulate, and easier inspection and maintenance through relocation of thermometer bulb and expansion valve, near a removable inspection panel.



Frostrode units 751, 3002 and 5001 (l. to r.)

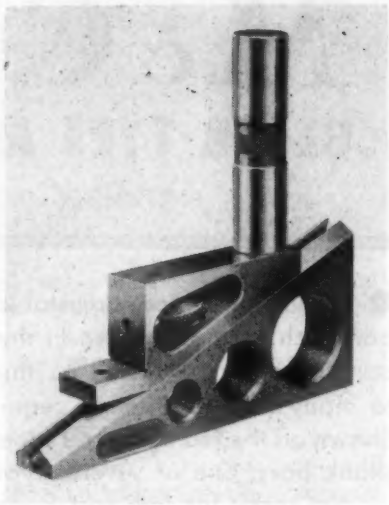
The Frostrode line is now comprised of four basic standard units, Models 751, 1501-E, 3002 and 5001, designed to maintain 0 F. to 10 F. coolant temperature during continuous production runs of one, two, four and six light aluminum welders respectively, or an equivalent load of steel welders or other machines. All units are now designed for use of methyl chloride refrigerant.



Fostoria infra red unit

Fostoria Infra Red Unit Develops High Temperature

A hand-model infra red unit capable of developing temperature in the range of 1000 F. is being made by The Fostoria Pressed Steel Corporation, Fostoria, Ohio. Known as model LRJ-3 it has many possible uses, including: soldering; melting or flowing of greases, oils, etc.; preheating materials; drying of moisture and liquid coats; thawing frozen pipes, and removing paint from wood.



Vaughn planer gage

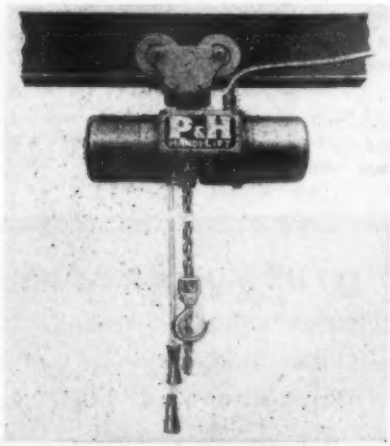
Vaughn Planer Gage Is Parallel at All Positions

A planer gage, offered by Vaughn Tool & Gage Co., 9934 E. Forest, Detroit 13, Mich., provides easy adjustment and positive lock. It is guaranteed parallel at all positions within 0.0001 in. It is ¾ in. thick, with all gaging surfaces lapped.

P & H Handi-Lift Hoist for Bolt, Hook or Trolley Use

The Handi-Lift electric chain hoist, being manufactured by Harnischfeger Corporation, Milwaukee 14, Wis., is interchangeable to bolt, hook or trolley mounting through the loosening of just one bolt. In trolley service, it can be suspended either parallel or crosswise to beam for flexibility.

Rated at 500 lb., the unit has high reserve power and is equipped with a chain proof-tested for 1,800 lb. Op-



Harnischfeger Handi-lift

The Growing Trend Towards

USE OF *Large* CARBOLOY DIES *for* SHEET METAL DRAWING...

Indicative of the growing trend towards use of large Carboloy Dies for sheet metal drawing is this recently produced die with Carboloy nib size of approximately 9½" I.D., 13" O.D. and height of 3¾". Weighing over 100 lbs. rough cored, this is the largest piece of Carboloy Cemented Carbide produced to date.

Today the benefits of Carboloy Die use—in terms of uniformly close tolerances, "mirror-like" finish free from scratches, long die life and lower die cost per piece produced—are steadily extending into fields once confined to "conventional" dies. Carboloy Die Specialists will be glad to work with your organization in bringing these benefits to your plant.

CEMENTED CARBIDES

CARBOLOY
TRADEMARK

SHEET METAL DRAWING DIES

CARBOLOY COMPANY, INC.

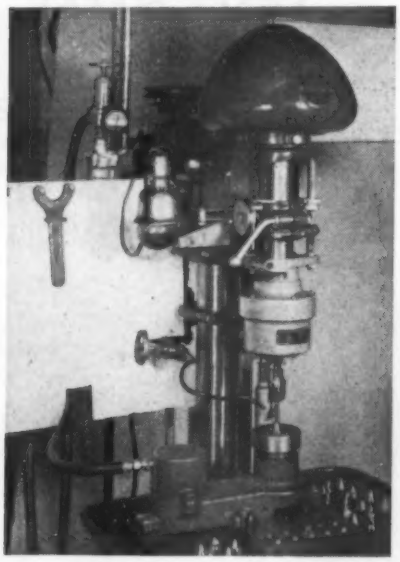
11149 E. 8 Mile Avenue, Detroit 32, Michigan

BIRMINGHAM • CHICAGO • CLEVELAND • LOS ANGELES • NEWARK • PHILADELPHIA
PITTSBURGH • SEATTLE • THOMASTON, CONN.

eration is through a pull cord which actuates a simple lever toggle arrangement, which leaves one hand free to guide the load.

Overtravel of hook at both upper and lower limits is prevented by a safety limit stop which also actuates control for raising and lowering loads. Dual braking is provided by a large spring-set electric motor brake. lowering control is by dynamic means supplemented by the spring set brake which holds the load, should current fail.

The unit operates on 3-phase 60 cycle, 220 or 440 volt power and is shipped complete, ready to install.



Redmer air chuck

Redmer Air Collet Chuck Has Capacity Up To 1¾ in.

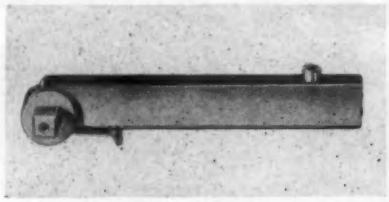
New sizes of the Redmer air chuck provide for collet capacity up to 1¾ in. They are manufactured by Redmer Air Devices Corp., 601 W. Washington Blvd., Chicago 6, Ill. The chucks use B & S type screw machine collets so work can be held to center and depth.

Keller ratchet wrench

Keller Pneumatic Wrenches Have Double Strength Pawls

Keller pneumatic ratchet wrenches, manufactured by Keller Tool Company, Grand Haven, Mich., are said to have double strength in the pawl. This is accomplished by providing two ratches to engage teeth of the socket and two compression springs for balanced pressure at point of contact with the ratchet. The cam is lubricated from the same fitting as is used to grease rotor and gears.

The tool is available in three sizes, with sockets for use of nut-running jobs ranging from ¼-in. to ¾-in. All tools have a head clearance not exceeding ½ in. Sockets are broached through so the tool can be used for removing nuts as well as tightening.



Richmont torque wrench

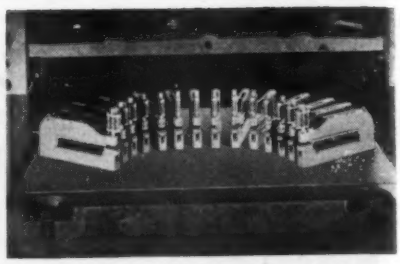
Richmont Torque Wrenches Made to Specified Torques

Audible and physical signals are given when the desired torque is reached with the socket drive models of Livermont Torq-Stop wrenches made by Richmont, Inc., 215 West 7th St., Los Angeles 14, Calif. Set at torques specified by buyers, these wrenches do not require dials, battery indicators or bulky equipment. Torque cannot be influenced in any way by the operator, and tolerances are held to plus or minus 2 percent. When proper load is reached there is a distinct click and at the same time a small, blunt plunger taps the operator's palm. Torque settings are available on order from 8 to 750 in.-lb.

Wales Hole, Punching Units May Be Used Interchangeably

Wales Type BC hole punching units are now produced by Wales-Strippit Corporation, N. Tonawanda, N. Y. These units are used to punch an unlimited number of straight line, scattered and staggered hole patterns with varying center-to-center distances. Square sheared and curved sheets and long strips of flat material may be perforated with these units in short or long runs.

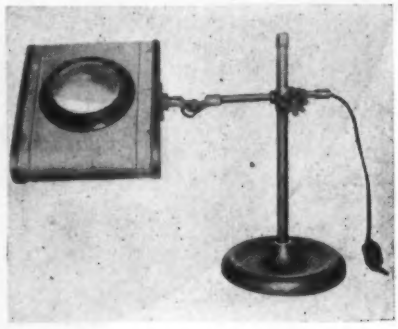
A group of BC units may be used interchangeably in press brakes and stamping presses by mounting on T-slotted plates, templates and rails. After a pattern has been run, the same group of units may be used in another hole punching pattern, thus eliminating dead storage of units.



Wales BC hole punching units

BC units are made of punches, dies and stripping guide assemblies, held together by holders as independent units. Holders keep punch and die in alignment. Nothing is attached to the press ram. Various diameter holes up to 5/16 in. diameter may be punched with the same unit by simply changing punch, die and stripping guide assembly. Ample stripping pressure is provided for punching holes in material up to ⅛ in. thick. Throad depth of 4, 7 and 9 in. permit a wide range of pattern set-ups. Thin holders permit punching holes as close as 1 in. center-to-center.

The die is a press fit into the holder and may be tapped out through a slug clearance hole.

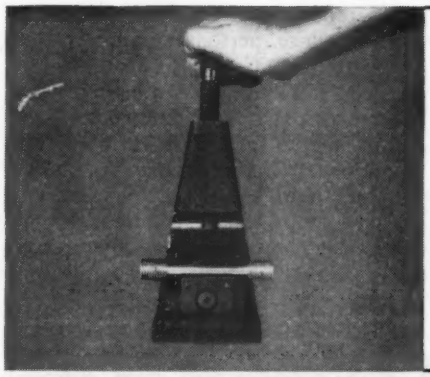


Lowe Inspector-Lite

Lowe Portable Inspector-Lite Magnifies and Illuminates Work

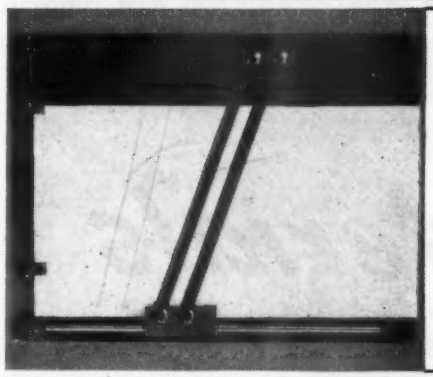
S. Lowe & Sons, Fairfield, Conn., is making a portable lighting instrument for magnifying and illuminating objects which require rapid and close visual inspection Lighting is provided by two tubular lamps. A 4-in. lens doubles the size of the inspected work. The universal type arm is completely adjustable to all positions. Height of the vertical pedestal is 14 in. and an extra 3-in. base is provided for permanent bench mounting. The light operates on 110-volt a.c. or d.c.

3 helpful time-savers for the LABORATORY



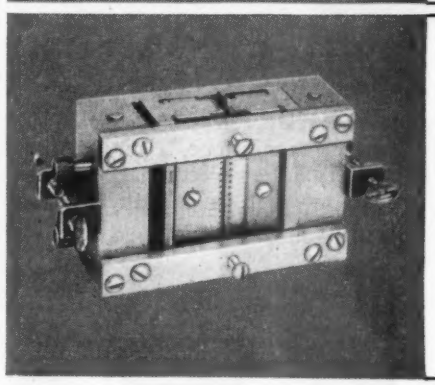
GAGE POINT PUNCH

1. Time-Saver No. 1 . . . automatically centers either round or flat specimens. Marks four uniform 2-inch gage-length centers with one push of the handle. Automatically adjustable to suit soft or hard materials. Accommodates rounds ⅛" to ¾" dia.; flats ½" to ¾" wide and zero to ¾" thick.



PARALLEL RULER

2. Time-Saver No. 2. This parallel ruler assembly facilitates and simplifies the rapid determination of yield strength, and data from stress-strain curve.

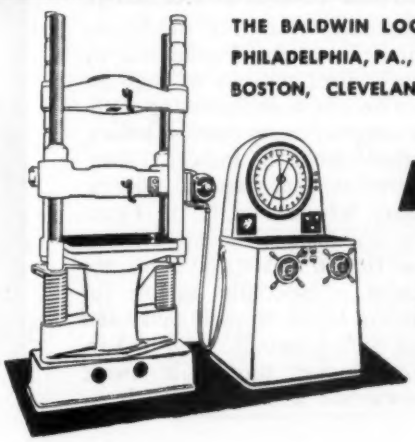


EDGE-COMPRESSION TESTING JIG

3. Time-Saver No. 3. This simple inexpensive new jig permits direct determination of compression yield strength from a single test sheet, rather than use of a pack. Simplifies testing technique.

BALDWIN PRODUCTS

Hydraulic presses, Testing equipment, Steel forgings and castings, Diesel-electric locomotives, Diesel engines, Metal plate fabrication, Rolled steel rings, Bronze castings, Heavy machine work, Crane wheels, Bending rolls, Plate planers, Babbitt metal, Alloy iron castings, Briquetting presses.



THE BALDWIN LOCOMOTIVE WORKS, BALDWIN SOUTHWARK DIVISION, PHILADELPHIA, PA., U.S.A. OFFICES: PHILADELPHIA, NEW YORK, WASHINGTON, BOSTON, CLEVELAND, CHICAGO, ST. LOUIS, HOUSTON, SAN FRANCISCO

BALDWIN

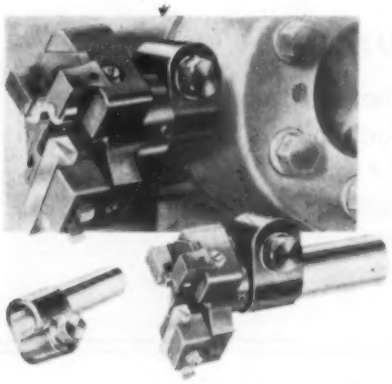
SOUTHWARK

TESTING EQUIPMENT

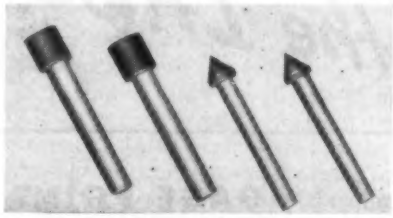
BLW THE BALDWIN GROUP

Boyar-Schultz Adapter Said to Double Screw Machine Capacity

Four sizes are available in the Model H adapter being made by Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill., for use on screw machines. The adapters are said to double the capacities of such machines. Such currently being made are ⅝ to ¾ in., short; ⅝ to ¾ in., long; ⅝ to 1 in. and ¾ to 1 in. Larger sizes are to be made available in the near future. The adapter permits use of more than one size tool.



Boyar-Schultz adapter



Champion diamond-tungsten burrs

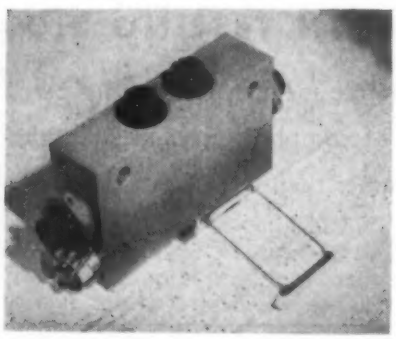
Champion Burrs and Wheels Made of Tungsten and Diamond

Diamond impregnated tungsten burrs and wheels are a development of Champion Diamond Tool Company, 551 Fifth Ave., New York, N. Y. The cutting portions of these burrs and wheels are formed from a mixture of tungsten powder and diamond grit. They are suitable for use on all tungsten steel dies, for fast deburring, for precision surfacing and smooth final finishing. They are available in sizes from ⅛ to 1 in. diameter and in round and conical shapes.

Clad Protective Skin Creams For Wet and Dry Work Conditions

To reduce the hazards of dermatitis and reduce personal wash-up time, the B. F. Goodrich Co., Akron, Ohio, has developed a line of protective skin creams, known as Clad, for wet and dry applications. The dry cream has been made as neutral to the skin as possible to eliminate drying, burning or irritation. It protects the skin against dirt, grease, grime and other hard-to-wash-off substances. The wet cream is prepared for use in cases where the skin is exposed to water and other dilute aqueous and mild chemical solutions. Both leave the skin soft and smooth.

Parts and Materials



Adel hydraulic lock valve

Adel Hydraulic Lock Valves Maintain Operating Pressures

Three sizes of small, light weight, hydraulic lock valves are being produced by Adel Precision Products Corp., Burbank, Calif., to protect hydraulic controls against operation failures due to leakage. The valves lock hydraulic fluid in cylinders or motors until direction control valve is operated, thus maintaining pressure in the actuating mechanism.

A thermal relief valve is incorporated in each lock valve cylinder port to bleed off excess pressure at from 1,200 to 2,000 psi., depending upon requirements. Operation range is from —65 F. to +160 F. The valves may be obtained for various tubing size installations.

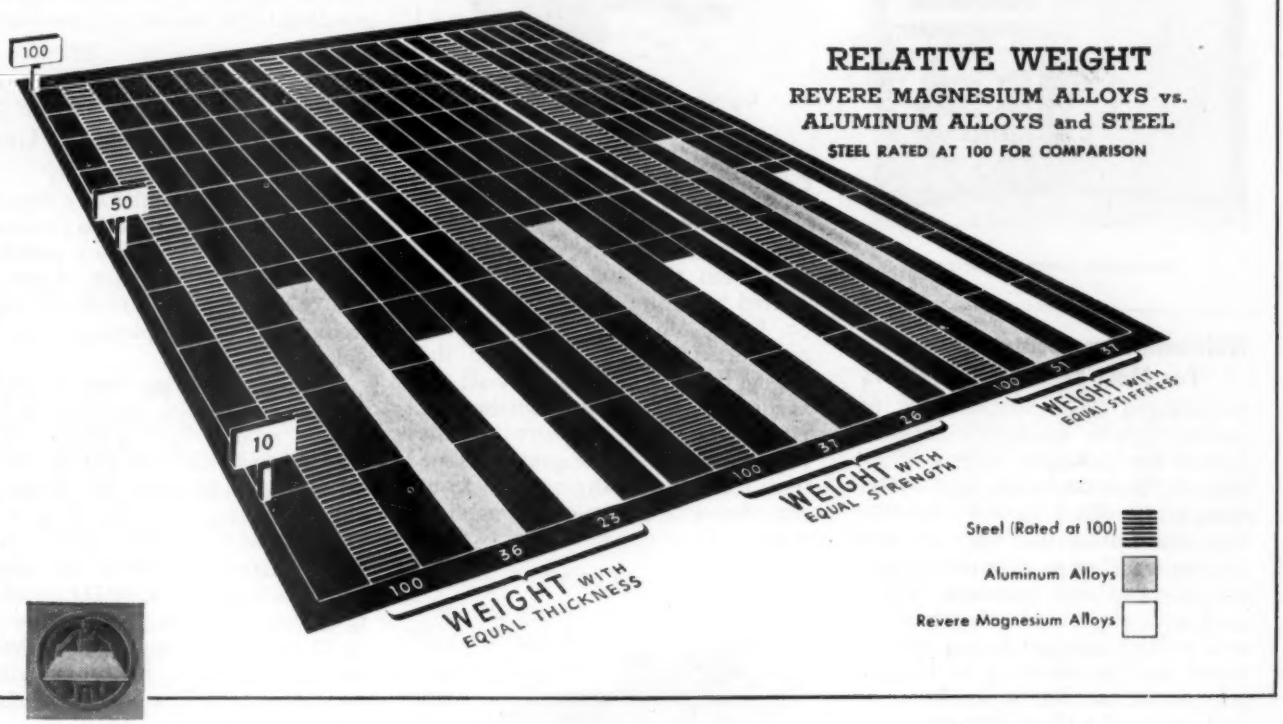
G-E Electronic Relay Said to Increase Control Device Range

An electronic relay for amplifying the limited current transmitted by delicate control contacts or high resistance circuits, thus increasing application range of many control devices, is available from the Industrial Control division of General Electric Company, Schenectady, N. Y. Operated by any material having a resistance of from 0 to 500,000 ohms, the new relay is especially suitable for controlling liquid levels in tanks and boilers, sorting metallic parts by size, detecting broken threads in textile machines, and as a limit switch requiring extremely light pressure to operate.

The relay consists of a standard type electronic tube, a supply transformer, and an electromagnetic relay —all mounted in a totally enclosed

G-E electronic relay

NOW AVAILABLE } Magnesium Alloy Sheets by REVERE



THE world's largest magnesium sheet and plate mill is now in operation—by Revere. Here are produced the three alloys in demand for wartime uses:

Revere Magnesium "M" — Magnesium-Manganese alloy with moderate strength and good forming characteristics.

Revere Magnesium "FS-1"—magnesium-aluminum-zinc alloy, a general purpose metal combining high strength with good forming characteristics.

Revere Magnesium "J-1" — magnesium-aluminum zinc alloy, the highest strength sheet available.

When production exceeds war needs, Revere Magnesium Alloys will be available for use in an ever-increasing number of fields, such as automotive, household appliances, railroads. These alloys will bring revolutionary economies in weight, power, machining, production, labor. For technical assistance in planning conversion to these wondrously light magnesium-base metals, write Revere.

REVERE MAGNESIUM ALLOY SPECIFICATIONS

Grades and Tempers
h = hard rolled a = annealed
r = hot rolled
Alloys M, FS-1, and J-1 can be furnished in these tempers:
Revere M Tempers h, a, r.
Revere FS-1 Tempers h, a, r.
Revere J-1 Tempers h, a, r.
The mill should be consulted regarding these tempers.

LIMITS OF MANUFACTURE

Sheets and Plates

Supplied from 0.020 inch and thicker in a wide range of sizes, depending upon the thickness and weight of the sheet or plate.

INDEX TO SPECIFICATIONS

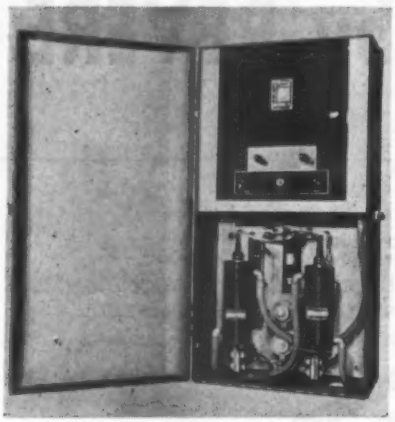
Form	Revere Alloy	American Society for Testing Materials Alloy Designation	American Society for Testing Materials Specification No.	Society of Automotive Engineers	Aeronautical Material Specifications S. A. E.	Navy Bureau of Aeronautics Alloy Designation	Navy Bureau of Aeronautics Specification No.	Navy Department Alloy Designation	Navy Department Specification No.	U. S. Army Air Forces Alloy Designation	U. S. Army Air Forces Specification No.
Plate, Sheet and Strip	M	11	B90-41T	51	4370	..	..	11	47 M 2	1	11339
	FS-1	18X	B90-41T	..	....	..	..	18	47 M 2	..	11340
	J-1	8X	B90-41T	..	4380**	..	..	8	47 M 2	2	11338

**4380 annealed 4381 hard rolled

REVERE
COPPER AND BRASS INCORPORATED
MAGNESIUM-ALUMINUM DIVISION
Founded by Paul Revere in 1801
Executive Offices: 230 Park Ave., N. Y. 17, N. Y.

cover, suitable for wall or machine mounting.

In operation, the electromagnetic relay in the device is kept energized as long as the controls connected to the input grid circuit of the electronic tube remain open. The instant the contacts close, the relay is deenergized.



Weltronic timer-contactor

Weltronic Time-Contactor For Most Resistance Welders

A packaged timer-contactor unit to provide simple, automatic electronic control for resistance welders is offered by Weltronic Company, 19500 West 8 Mile Road, Detroit 19, Mich. The combination unit may be used for new machines or to convert manually or cam-timed machines. When used with air or hydraulically operated welders interunit wiring is eliminated and the mounting of all controls on the machine is possible.

A universal wall or floor mounting cabinet houses any combination of interchangeable Weltronic timers, together with a choice of Ignitron or mechanical type contactors as required. A single power supply unit operates all standard control panels from either 115, 230 or 460 volt a.c. lines. The cabinet is 16½ in. wide, 33 in. high and 10½ in. deep. Synchronous timing and heat control may be added for complete machine control at any time without rewiring or scrapping any element of the basic timer-contactor controls.

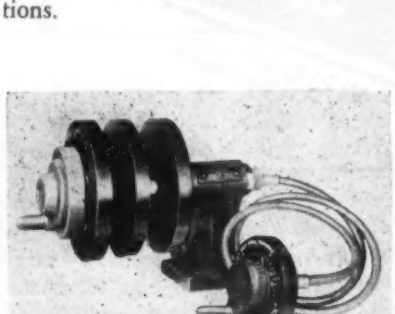
du Pont Adhesive "78" For Use on Containers

E. I. du Pont de Nemours & Co., Wilmington, Del., has introduced adhesive "78" for use in producing weather-proof paperboard shipping containers. The material meets government specifications for such containers. It is a stable, white powder, mixed in standard mixing equipment, that can be used on standard boxboard machinery at full speed without any special equipment.

Century d.c. engine generator

Century Engine Generators Made in 1 to 200 Kw. Sizes

Direct curent engine generators in sizes from 1 to 200 Kw. are being offered by Century Electric Company, St. Louis, Mo. The generators are constructed to bolt directly to the engine housing and engine shaft. It is equipped with one ball bearing, the engine end being supported by the engine bearing. These generators are built for voltages ranging from 15 to 500, for a wide variety of applications.



American Speed-Jack

American Pulley Transmission Available for Drives to 1 hp.

A variable-speed transmission for drives up to 1 hp. that features simplified remote control and universal mounting is announced by The American Pulley Company, 4299 Wissahickon Ave., Philadelphia 29, Pa. Remote control is effected through a flexible shaft that makes possible the mounting of the unit anywhere in or on the machine and place control in a convenient location. The unit is known as the Speed-Jack.

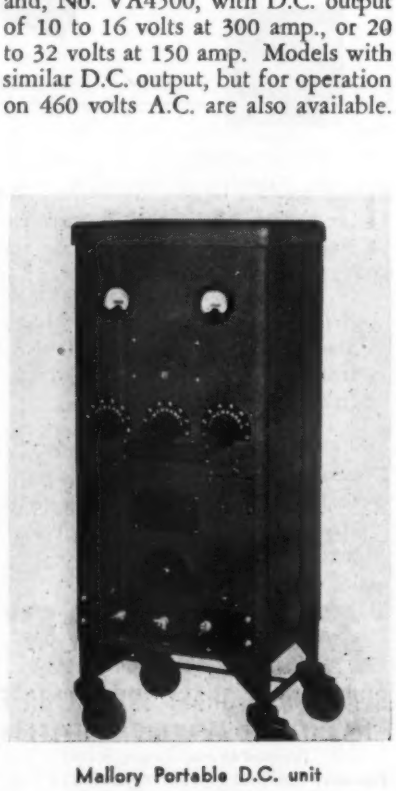
The Speed-Jack utilizes V-Belts to provide stepless control of speed through a 3 to 1 ratio. Design of the control mechanism eliminates ratio creep and assures constant belt alignment regardless of the unit's position, belt wear or belt stretch. Because movement of the flanges is controlled mechanically the Speed-Jack may be mounted vertically, horizontally or any other position best suited to the equipment on which it is used. Steel-faced plastic flanges contribute to lightness of the Speed-Jack and is said to provide accurate balance and smooth, silent operation.

The unit is said to be adaptable to a wide variety of machines such as band saws, conveyors, drills, internal grinders, lathes and milling machines.

Mallory Portable D.C. Power Supply Operates from A.C. Lines

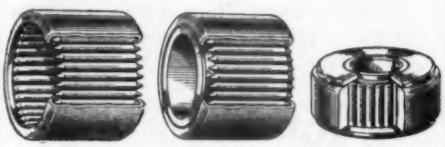
Designed for use on assembly lines, laboratories and maintenance departments, P. R. Mallory & Co., Indianapolis, Ind., has available a portable D.C. power supply for use in testing and operating all electrical and electronic equipment employing 12 or 24 volt systems.

The unit operates from 3 phase A.C. lines of 208 and 230 volts. Three models are offered: No. VAi500, with D.C. output of 10 to 16 volts at 100 amp., or 20 to 32 volts at 50 amp.; No. VA3000, with D.C. output of 10 to 16 volts at 200 amp., or 20 to 32 volts at 100 amp.; and, No. VA4500, with D.C. output of 10 to 16 volts at 300 amp., or 20 to 32 volts at 150 amp. Models with similar D.C. output, but for operation on 460 volts A.C. are also available.

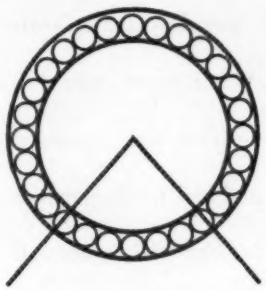


Mallory Portable D.C. unit

Design of Needle Bearings Eliminates Stress Concentrations

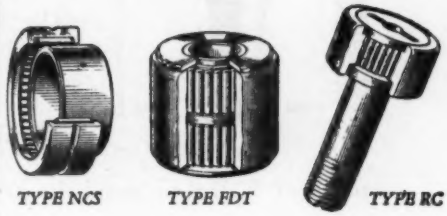


TYPE DC *DC (Inner Race)* *TYPE AT*



LOAD ZONE

Note how the load is distributed. The large number of the needle rollers which are within the theoretical "load zone" provide many linear inches of contact with bearing surfaces.



TYPE NCS *TYPE FDT* *TYPE RC*

•

FULL COMPLEMENT OF NEEDLE ROLLERS PROVIDES MANY LINEAR INCHES OF CONTACT; DISTRIBUTES LOAD OVER LARGER AREA

•

Elimination of stress concentrations is one of the outstanding features of all Torrington Needle Bearings which stems from their basic design principle —the use of *a full complement* of small diameter needle rollers.

In operation, this means that the load on the Needle Bearing is widely distributed over a comparatively large number of rollers, and each in turn provides "line" contact with inner and outer race. As illustrated in the accompanying diagram, a large number of needle rollers are always within the "load zone" as the rollers revolve around the shaft. Thus the load is *evenly* distributed and the full capacity* of the bearing may be utilized without fear of concentration of stresses at any given point or on any single component of the bearing. As long as the design load is within the rated capacity of the bearing, the dangers of rapid or uneven wear, of stress fatigue, or of brinelling bearing parts are virtually eliminated.

This feature, coupled with the efficient lubrication of rollers, made possible by the design of the outer raceway which serves to hold the lubricant within the bearing, insures maintenance-free operation and long service life.

For All Design Requirements

From the several types of Torrington Needle Bearings available, the design engineer may select the one best suited to the requirements of a particular application. Load, speed, service conditions, design limitations and cost considerations can be met with full confidence that the right Torrington Needle Bearing, properly installed, will provide long bearing life and freedom from service attention. Let our engineering department work with you in selecting the correct type Needle Bearing for your application. Experience in layout and design of hundreds of different applications will enable our engineers to give practical assistance in meeting your design requirements. More information on the types and sizes of Torrington Needle Bearings together with a more complete description of the advantages of these compact, anti-friction units, will be found in our Catalog No. 105 available on request. Send for your copy.

**Utilization of full or theoretical capacity of Needle Bearings is dependent upon proper shaft hardness, correct installation and other factors. See Torrington Needle Bearing Catalog for more complete information.*

THE TORRINGTON COMPANY

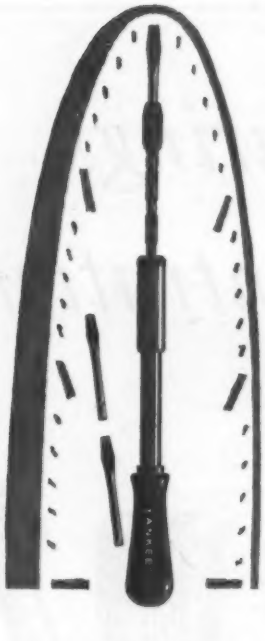
Established 1866 • Torrington, Conn. • South Bend 21, Ind.

"Makers of Needle Bearings and Needle Bearing Rollers"

New York Boston Philadelphia
Detroit Cleveland Seattle
San Francisco Chicago Los Angeles
Toronto London, England

TORRINGTON

NEEDLE BEARINGS



MAKE TIME with "YANKEE" TOOLS!

Do the tools you buy make your work easier, faster, more efficient? Do they save you time, money, trouble? Will they stand the pressure of hard work, earning their keep by long, dependable service? They will, indeed, if they are "Yankee" Fine Mechanics' Tools, the choice of true craftsmen everywhere, for more than half a century. There's only one trouble with "Yankee" Tools today, but that's a trouble that will be corrected quickly by Victory: Supply can't keep up with demand . . . for "Yankee" Tools, you see, are at work for war. So remember the built-in ingenuity of "Yankee" Screw Drivers, Drills, Vises, Bit-Braces, and Tap Wrenches. They've been *designed* to make time! And making time, above, is "Yankee" Spiral Screw Driver No. 130A—a size for every purpose.

Order from your industrial supply distributor, or write North Bros. Mfg. Co., Dept. AM-644, Phila., Pa. Furnish priority ratings whenever possible, and every effort will be made to fill your orders.

"YANKEE" TOOLS

make good mechanics better

North Bros. Mfg. Co., Phila. 33, U. S. A.

Established 1880

TRADE PUBLICATIONS

ABRASIVES The Carborundum Co., Niagara Falls, N. Y., has announced a bulletin on its line of new "MX" wheels, mounted wheels and sticks for burring, finishing and polishing and many other industrial applications. In addition to covering the features of these products, the bulletin presents action photos showing them in operation, includes a table of grades and sizes, and gives complete ordering instructions.

ADAPTER Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill., has announced a bulletin on its Model H precision adapter for screw machine tools. Illustrated in color, this bulletin gives complete data, including prices.

ARC WELDERS General Electric Co., Schenectady, N. Y., has published a book on the importance of alternating current arc welding as a production tool and giving the basic reasons for its growing acceptance. The book also includes complete descriptions of all GE a-c welders for manual operation and gives details on many GE electrodes for a-c welding.

BENCH PRESS H. & H. Machine Tool Co., Prospect Hill Rd., Waltham, Mass., has released a bulletin giving complete specifications on their high-speed, safety clutch, bench press.

CHUCKS "The Handbook of Chucks" is the title of a pocket-size book written primarily for newcomers to the metal working industries and trade school students, and designed to give the answer to every possible question on the subject of chucks. May be secured in quantities from the Westcott Chuck Co., Oneida, N. Y.

CLAMPS A 32-page indexed booklet on a complete line of clamps has been prepared by Grand Specialties Co., Grand Ave. at Troy, Chicago 22, Ill.

CONVEYOR A new 11 ft. conveyor designed for all sorts of warehouse work is illustrated and described in a folder released by the Lamson Corp., Syracuse 1, N. Y. Not only does it show how this device can be used in a number of applications requiring only one unit, but also its use in a portable conveyor system made up of several units.

CUTTING MACHINES Just released is a four-page "Highlight" folder which displays the various models of Campbell abrasive cutting machines and gives a brief description of each machine. This folder was prepared by the Andrew C. Campbell Div., American Chain & Cable Co., Inc., Bridgeport,

Conn., so that those concerned with cutting problems might select the machine best suited to a particular job.

CUTTER SHARPENER An illustrated folder, giving complete data on the new Waltham cutter sharpener, may be obtained from the Edward Blake Co., 634 Commonwealth Ave., Newton Centre 59, Mass. The folder includes operating instructions and construction details, plus helpful information on correct sharpening practice for cutters 2 in. diameter and smaller. Complete specifications and standard and optional equipment are also included.

DRILL BUSHINGS The Accurate Bushing Co., Garwood, N. J., has issued Catalog No. 243 which completely covers their line of A.S.A. Standard drill jig bushings, including sizes, prices and ordering data.

DRIVE UNITS The Drive-All Mfg. Co., 3400 Conner Ave., Detroit 14, Mich., has announced publication of a folder entitled "Selective Speed Transmissions for All Types of Machines." This catalog illustrates the application of Drive-All units to simpler types of machine tools, gives complete specifications, and lists prices.

ELECTRONIC RELAY General Electric Co., Schenectady, N. Y., has issued a bulletin on its Type CR7511-A electronic relay. The bulletin is illustrated with photos and diagrams, and its eight pages of material cover the purpose, design, operation and uses of this relay.

ENGRAVER The H. P. Preis Engraving Machine Co., 155 Summit St., Newark 4, N. J., has issued a bulletin on its Panto utility engraver UE-3, a heavy-duty bench type for engraving, electrical marking and acid etching.

FASTENER The ESNA spring-lock fastener, newest addition to the self-locking Elastic Stop Nut and other aircraft fittings, is presented in a catalog available from the Elastic Stop Nut Corp., Union, N. J. This 36-page book includes complete specifications, sizes available, wide range of applications, test results and data for ordering.

FIRE PROTECTION A handbook (R-5827) that graphically explains the newest techniques in fighting fires with carbon dioxide has been prepared by Randolph Laboratories, Inc., 8 East Kinzie St., Chicago 11, Ill.

FLAME CUTTING Air Reduction Co., 60 East 42 St., New York 17, N. Y., is distributing an illustrated eight-page booklet (Form ADR-13) entitled "Machine Flame Cutting for Assembly Line Fabrication." The book describes assembly line fabrication of frames and other components for generators for Diesel electric units by

Intricate Steel Shapes Quickly Cut by Flame

Short Cuts and Economies Developed . . . Time Saved

Ryerson Steel Products in Stock—Immediate Shipment

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Carbon steel, alloy, tool steel, stainless. Hot rolled, cold finished, or heat treated, in all standard sizes and lengths.

PLATES
A full range of thicknesses and sizes . . . shear cut, flame cut, punched, or otherwise prepared to your order.

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A sheet for every purpose—more than 17 different types in stock.

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TOOL STEELS • STRIP • TUBING
INLAND 4-WAY FLOOR PLATE
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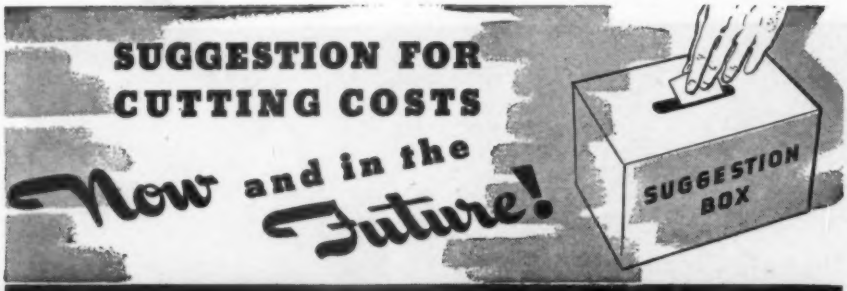
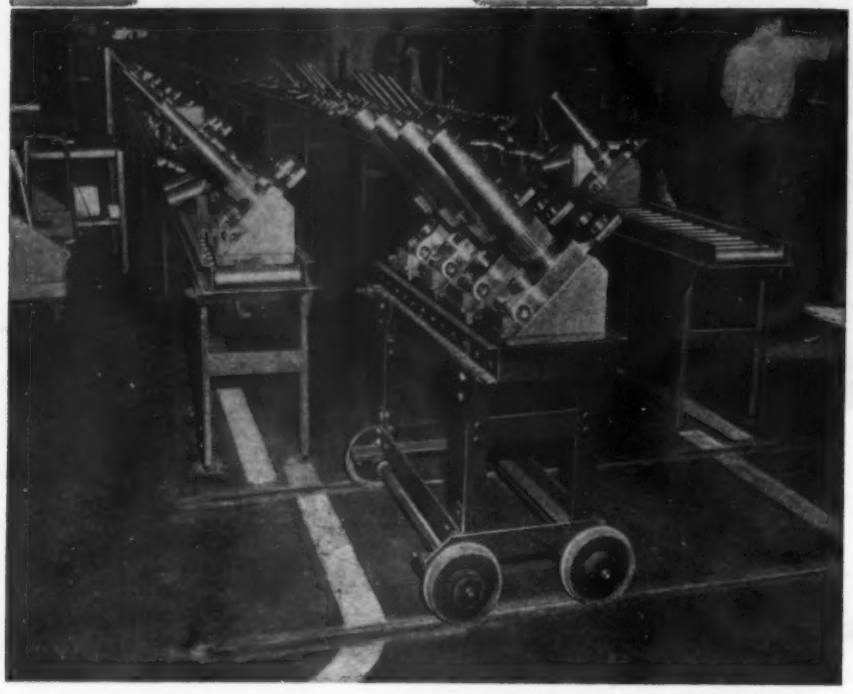
Many manufacturers are revolutionizing their products, saving time and effecting many economies by using strong rolled steel, flame-cut to exact size and shape. No matter how intricate the job, Ryerson flame-cutting equipment produces neat, accurate work—and hundreds or thousands of identical pieces are turned out quickly.

Whenever you need flame-cutting service, call Ryerson. You'll get immediate action—prompt delivery. If there is any question, we will review your specifications or estimate any job you have at hand. Get in touch with the nearest Ryerson plant.

Joseph T. Ryerson & Son, Inc., Steel-Service plants: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Pittsburgh, Philadelphia, New York.

RYERSON STEEL-SERVICE





Look Into Everything ROLLER CONVEYORS Can Do . . . Ask STANDARD CONVEYOR

THE steps you take now — the investment in equipment that you may make to cut handling costs will not only pay dividends immediately but can be expected to yield equal or even greater returns in postwar days to come, when handling and other unproductive costs will be under the closest scrutiny.

For example, roller conveyors installed now will be useful in many ways no matter what you may be making or handling when peacetime is here. Roller conveyors are unequalled in low first cost, flexibility and minimum operating expense. They handle a wide range of commodities —parts, packages, units, cartons, cans, bottles, barrels, bundles, drums, boxes. They are available in light, average, or heavy-duty types for either portable or stationary use — in a wide variety of sizes, styles and lengths. Roller conveyors are built in their entirety by Standard, including the vital bearings which are manufactured to the highest standards.

Besides roller, Standard builds belt, chain, slat, and push-bar conveyors, also spiral chutes, tiering and lifting machines, portable pilers, and pneumatic tube systems.

On any conveyor requirement Standard Conveyor is equipped by experience and facilities to recommend and furnish the right type of equipment.

STANDARD CONVEYOR CO.
General Offices: North St. Paul, Minn.
Sales and Service in Principal Cities

TIERING AND LIFTING MACHINES

PORTABLE PILERS

SPIRAL CHUTES

PNEUMATIC TUBE SYSTEMS

oxyacetylene flame cutting, using machines of the multiple torch type.

HEAT EXCHANGER Bulletin 96, offered by the Niagara Blower Co., 6 East 45 St., New York 17, N. Y., illustrates and describes its newly developed "Balanced Wet Bulb" temperature control for the Niagara Aero heat exchanger.

INDEX FIXTURES Hardinge Brothers, Inc., Elmira, N. Y., has published a folder on an addition to their line of collet index fixtures—the HV-4N horizontal-vertical collet index fixture with threaded nose spindle.

INDUSTRIAL RELATIONS Editorial Research Inc., 60 East 42 St., New York 17, N. Y., has commenced publication of a monthly periodical under the title of "Gung Ho." Designed to create a friendly and cooperative attitude between the human elements in industry, each issue will be made up of inspirational articles and illustrations. Vol. 1, No. 1 has such outstanding contributors as Ernie Pyle, Frank Irving Fletcher, Dr. Walter H. Eddy, Albert Turner Reid and Fred Packer.

MATERIALS Dohner & Lippincott, 500 Fifth Ave., New York 18, N. Y., has available a limited supply of an article entitled "The Coming Battle of Materials," reprinted from "Interiors" magazine. It is a discussion of materials, and the effects their characteristics and methods of manufacturing and fabricating have in the field of industrial design.

MEASURING AND GAGING TOOLS The complete line of measurement and inspection tools manufactured by McGrath St. Paul Co., Fifth and Wacouta Sts., St. Paul, Minn., is described in a bulletin "Precision Tools." In addition to describing rules, calipers, height gages, micrometers and other type gages, the booklet contains a number of engineering reference tables, a discussion of the principles of the Vernier scale and a brief review of rules governing shop arithmetic.

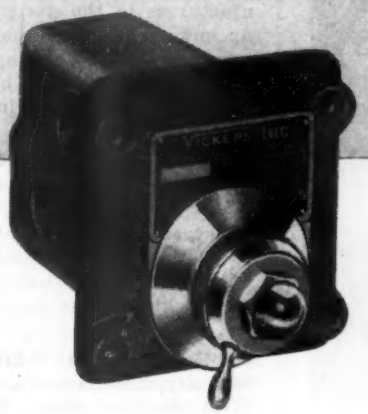
MEASURING TOOLS The Van Keuren Co., Watertown 72, Mass., has issued a catalog and handbook, No. 32, covering measuring equipment including light-wave micrometers, master blocks, gages, measuring rolls, thread measuring wires and others. The handbook section gives complete information on the use of this equipment, especially threads and thread measurement by the three-wire system.

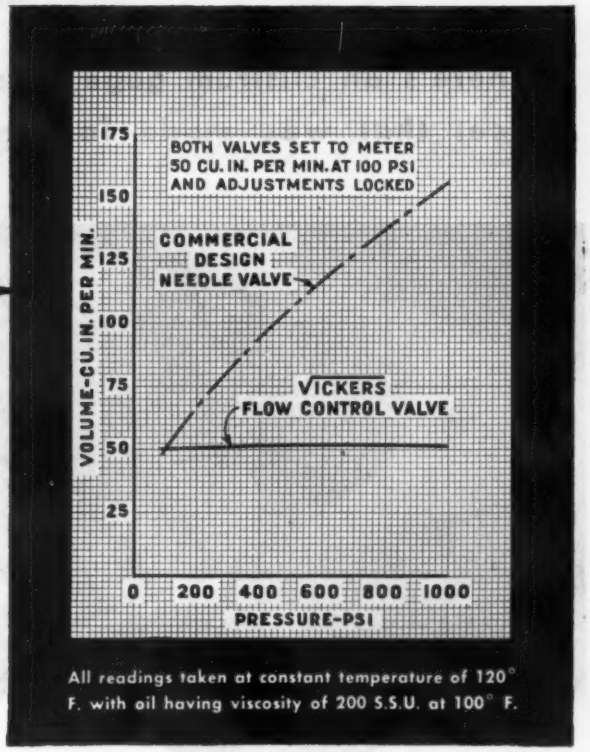
MEEHANITE CASTINGS Bulletin No. 18 entitled "Meehanite—the Metal for Postwar Castings" has been announced by the Meehanite Research Institute of America, Pershing Square Bldg., New Rochelle, N. Y. This four-page illustrated folder describes a variety of recent applications of these castings for highly stressed parts, formerly specified as steel or high alloy castings.

CONSTANT FLOW RATE

Regardless of

VARIATIONS IN FLUID PRESSURE





All readings taken at constant temperature of 120° F. with oil having viscosity of 200 S.S.U. at 100° F.

As shown by test chart at right, the Vickers Flow Control Valve maintains a practically constant metering rate (for a given setting of the control adjustment) regardless of variation in fluid pressure. This ability to accurately control the rate of travel of tool head or slide . . . or the rpm of a hydraulically driven work spindle . . . at all times regardless of the resistance encountered is a fundamental requirement of many types of machine tools and special machinery. The absence of a hesitation, jump or a speed variation with a load change is important because these nearly always are detrimental to tool life, work finish or proper operation. Tool damage when "breaking through" work is eliminated and variations in cut or operating pressure have no appreciable effect upon feed rate. See Bulletin 40-15 for complete information.

Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

VICKERS *Incorporated*

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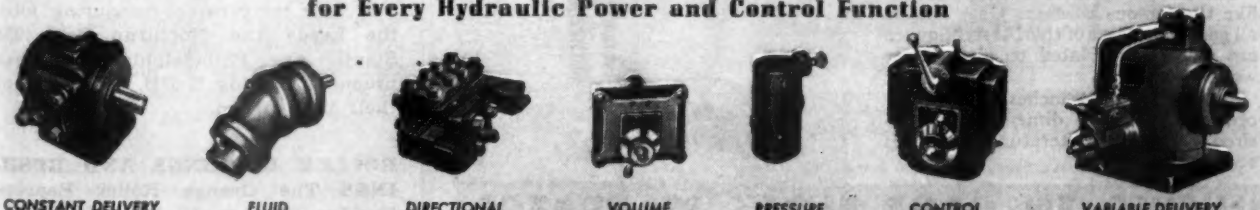
VICKERS

Adjustable

FLOW CONTROL VALVES

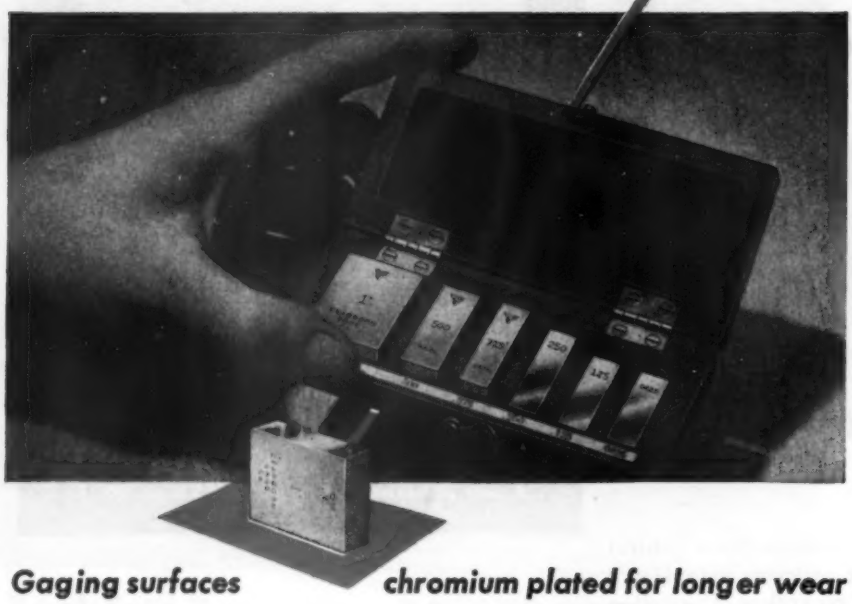
Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



CONSTANT DELIVERY PUMPS | FLUID MOTORS | DIRECTIONAL CONTROLS | VOLUME CONTROLS | PRESSURE CONTROLS | CONTROL ASSEMBLIES | VARIABLE DELIVERY PUMPS

TOOL MAKERS . .

. . here's an Ellstrom gage block set that was made for you



Gaging surfaces *chromium plated for longer wear*

This Ellstrom Tool Makers Set is the first set of its kind to be offered with *chromium plated gaging surfaces* for longer wear. It is a personalized set for those tool makers who want their own individual set of standards for checking purposes. Each set consists of 6 blocks in the following sizes, .0625, .125, .250, .375, .500 and 1" contained in a hand-rubbed walnut case. These Ellstrom sets are available in standard accuracies. Write today for prices and delivery dates.

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

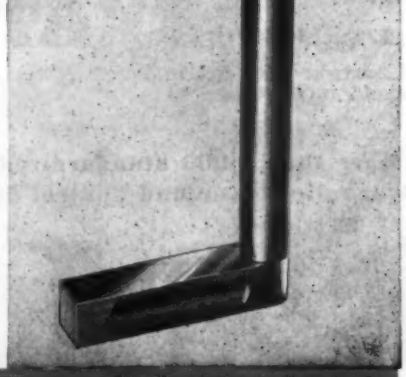
Originators of Chromium Plated Gage Blocks

The
ELLSTROM
MASTER SQUARE
(Patent Applied for)

Here's a new idea that multiplies the normal life of a square—an upright cylinder that can be turned to a new surface as wear develops during checking operations.

Another distinctive feature is that like the famous Ellstrom Gage Blocks all gaging surfaces of this Master Square are Chromium Plated to give longer wear.

Sizes start at 4 inches and can be obtained in larger dimensions as desired. Descriptive literature and prices sent on request.



FINISHED TO GAGE BLOCK STANDARDS

MILLING MACHINE A catalog covering its 28 in. vertical Hydro-Tel milling machines, M-1284, is available from Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio. This illustrated booklet covers standard equipment for conventional milling operations, hydraulic automatic depth control for die-sinking and similar operations, selective 360 deg. automatic profiling wherein the unit may be bypassed and the machine used for conventional milling, and non-selective 360 deg. automatic profiling for profile milling only.

MOTORS "Out of Thin Air" is a new brochure prepared by The Dumore Co., Racine, Wis., to tell something about the strides made by motor manufacturers in the design of fractional hp. motors since the beginning of the war to meet the exacting requirements imposed upon them by the urgent needs of the aircraft industry.

OILERS—Trico Fuse Mfg. Co., Milwaukee, Wis., has announced Bulletin No. 26-B which illustrates and describes a modernized, streamlined oiler with a crystal-clear, reinforced plastic reservoir that is 50% lighter in weight and has no gaskets to leak.

PIPE THREAD GAGES Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn., has prepared a folder on the new ANPT pipe thread gages, the "Fighting Pipe Thread" that has been specified for Army and Navy Aeronautical installations. Colorfully illustrated, this bulletin tells what these gages are, what they do and how they can be used.

PLASTICS A folder on "Toolite," a thermosetting phenolic plastic for casting tools, dies and fixtures, has been published by Adhere, Inc., 1220 Maple St., Los Angeles 15, Cal. The folder explains the properties, characteristics and procedures of this ready-compounded plastic and also illustrates the simple steps of producing plastic tools.

PROFILE GRINDER A bulletin offered by Boyar-Schultz Corp. 2110 Walnut St., Chicago 12, Ill., illustrates and describes profile grinder No. 1 for tool and die shops and profile grinding in production.

PYROMETERS To show how war plants have been applying Rayotubes and Micromax equipment to important new temperature-measuring jobs, the Leeds and Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., has prepared Catalog N-33B, a revision of their 1941 edition.

ROLLER BEARINGS AND BUSHINGS The Orange Roller Bearing Co., Inc., Orange, N. J., has prepared

two catalogs, one on "staggered" roller bearings and the other on roller bushings. Both contain pages of shaft and housing tolerances, life and load factor graphs, typical application diagrams, and photos of various types.

STEAM JETS The Heil Engineering Co., 12901 Elmwood Ave., Cleveland 11, Ohio, has issued Bulletin 43 covering a line of steam jets for heating and agitating pickling baths, chemical solutions, tank aeration and mixing in various type tanks.

STEEL Jessop Steel Co., Washington, Pa., have prepared a folder on their precision gage stock steel which is particularly suited for applications requiring the use of two flat parallel surfaces. Included in this folder is complete data on size, applications, heat treatment, hardening and tempering of this material.

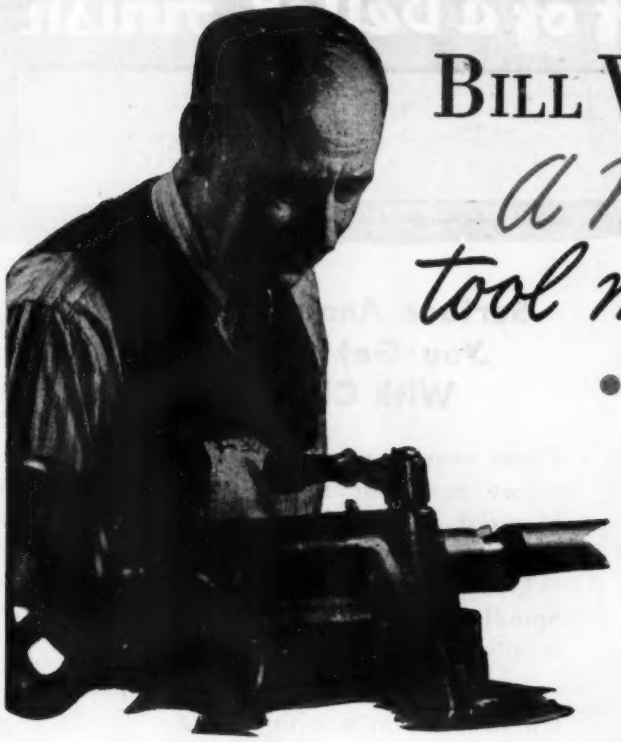
SURFACE PLATE George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., has prepared a four-page folder to introduce their OPTI-FLAT, a new glass optically finished surface plate which is guaranteed flat to .00005 in. insuring topmost precision for gaging height and parallel, straight, square and flat surfaces. The bulletin also includes information on other Scherr precision equipment.

TAP EXTRACTORS The Walton Co., 94 Alyn St., Hartford 3, Conn., has printed a bulletin on its six standard sets of tap extractors which are designed to meet almost any tap extracting problem. The bulletin gives complete information on sizes and prices and in addition describes and illustrates three simple steps for the removal of broken taps.

TAPS The Hy-Pro Tool Co., 461 Mt. Pleasant St., New Bedford, Mass., has prepared a catalog on taps. Conveniently indexed for ready reference, this book is divided into two sections the first of which gives complete information on the sizes and kinds of taps manufactured. Left-hand pages give a picture and description, list prices and discounts, and dimensions of the taps. Right-hand pages give thread limits for the taps shown on the opposite pages. The second section is devoted to engineering data on threading.

WELDERS Bulletin No. 103, available from the Progressive Welder Co., 3050 East Outer Drive, Detroit 12, Mich., describes the company's new Rocker-Arm welder designed for making between 500 and 1000 sound spot welds per hour on structural sections of aluminum ranging up to two ⅛ in. thicknesses of 24-ST.

WELDING MAINTENANCE How to save, protect and repair regulators, and welding torches and cutting torches is told in two booklets offered by the Smith Welding Equipment Corp., Min-



BILL WEEKS
a No. 1 tool maker

45 years experience as a tool maker—that is a record that few men can equal today! It is a record that Turner is also proud of, for it is skilled men like Bill Weeks who help us attain perfection in the manufacture of precision gauges.

When a boy, railroads appealed to Bill, and he worked in the shops of the Canadian Pacific, Southern Pacific and the Michigan Central. From there his trade took him to the Ford Motor Car Company, The Mercer Tool Company, The Wolverine Tube Company and finally Turner's.

Like most men who work inside, his is an outdoor hobby—specializing in the raising of prize petunias, and he is as skilled at that as he is at turning out fine precision gages.

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY
2625 HILTON ROAD • • FERNDALE, MICHIGAN

PLAST-O-LOCK PLUG GAUGES

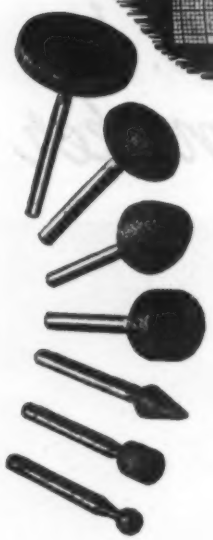
The Plast-O-Lock (patent applied for) collet-type gauge was designed by Turner engineers to multiply the life of the gauging surface of standard plug gauges.

This is accomplished by a collet of plastic, that is slotted and tapered to fit into the tapered end of an A. G. D. handle.

Because it is plastic the collet will not scratch or burr the gauging surface, thereby allowing most of the gauge's length to be used.

For descriptive literature and prices write our sales department today.

Proof of a Better Finish



Surface Analyzer Tape Proves You Get a Better Finish With Chicago Wheels

These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used, ½ x ½ x ⅛", Grain 180, Grade L Arcite FV Bond. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do it with Chicago Wheels. And, the secret of their superiority lies in the new FV Bond, developed exclusively for Chicago Wheels, after 50 years' experience making wheels for the most accurate and precise applications.

Here's What FV Bond Will Do for You

- Reduce your wheel costs.
- Produce a better finish without sacrifice of production time — a finish so smooth that you can measure it in micro inches.

TRIAL WHEEL FREE!

Write or send the coupon today for a Chicago Wheel, made with this remarkable new FV Bond. Tell us grinder you use, size wheel and kind of material on which you will make your test.

For the duration, with full WPB approval, we are specializing on small sizes—anything up to 3" in diameter.

Write for Catalog and one of the new Engineering Survey Forms, a step in the direction of better finishing.

CHICAGO WHEEL & MFG. CO.

America's Headquarters for Mounted Wheels and Small Grinding Wheels

1101 W. MONROE STREET
Dept. AT, CHICAGO 7, ILL.

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Industry

Send Catalog and Survey Form. Interested in ( ) Mounted Wheels. ( ) Grinding Wheels. ( ) Send Test Wheel. Size.....

Name .....

Address .....

AT-6

neapolis, Minn. Conveniently indexed, these books bring out, through the use of cartoons, the "do's" and "dont's" to be observed in the proper maintenance of these items.

NEW BOOKS

GUIDE TO METHODS IMPROVEMENT—*By Harold B. Maynard, president, Methods Engineering Council, and G. J. Stegemerten, staff supervisor, Westinghouse Electric & Manufacturing Company. 85 pages. Published by McGraw-Hill Book Company, 330 West 42 St., New York 18, N. Y.* $1.

A big "why" is the word around which this guide is developed. It advocates the adoption of a questioning attitude when viewing any and all plant operations.

This book does little telling, in the ordinary sense. What it does do, is give over 400 specific questions which covers ten points of opportunity for operational improvement. These points include design, process, inspection, material, material handling, work layout and tools and equipment. The questions are chosen to steer proper thought in studying any operation.

Before reaching the point of listing specific questions, a few chapters are devoted to showing how the questioning attitude enabled methods engineers to improve a variety of practices.

•

ESSENTIAL OF PRECISION INSPECTION—*By Wesley Mollard, instructor, machine shop, George Junior Trade School, Detroit. 207 pages. Published by the McGraw-Hill Book Company, 330 West 42 St., New York 18, N. Y.* $3.

This volume is essentially a manual for school use. It gives a description of standard shop inspection tools and gages, followed by a series of exercises in the use of these gages.

The student is also set straight in regard to the nomenclature of the work element he may be called upon to handle. He is given the definition of the various terms used to specify threads, gears, and other familiar machine elements. The book is suitable for use with American Machinist Handbook to which reference is made in the text.

•

EMPLOYEE COUNSELING—*Published by the Industrial Relations Section, Department of Economics and Social Institutions, Princeton University, Princeton, N. J.* $1.

The recent growth of employee counseling as a specialized function in war industries affords an illuminating example of evolution in personnel

NICKEL AIDS THE AUTOMOTIVE INDUSTRY

to KEEP 'EM ROLLING!

Using ingenuity and "know-how" born of long experience, automotive engineers designed the phenomenally successful transport equipment that now speeds the United Nations on the road to Victory.

Built to take punishment far above peacetime requirements, these specialized military vehicles are being produced in quantity by the mass-production methods that have amazed the world. From North Africa to the South Pacific, these trucks, jeeps, tanks and half-tracks have repeatedly met demands for stepped-up performance.

This kind of engineering-thinking pioneered the application of Nickel alloyed materials. Now, when uninterrupted operation is so vitally important, the widespread use of Nickel is clear evidence of its many advantages.

In steering knuckles or differentials, in forged gears or cast blocks, a little Nickel goes a long way to provide essential dependability. It improves strength/weight ratios, increases wear and corrosion resistance, imparts toughness, and assures uniform properties of the metals with which it is combined.

Today, maintenance crews on far-off battle fronts are learning what metallurgists and engineers here long have known . . . that, properly used, Nickel aids to "keep 'em rolling."

For years the technical staffs of International Nickel have been privileged to cooperate with automotive engineers and production men . . . men whose work is now so necessary to the Nation. Counsel, and printed data about the selection, fabrication and heat treatment of ferrous and non-ferrous metals is available upon request.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects — from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

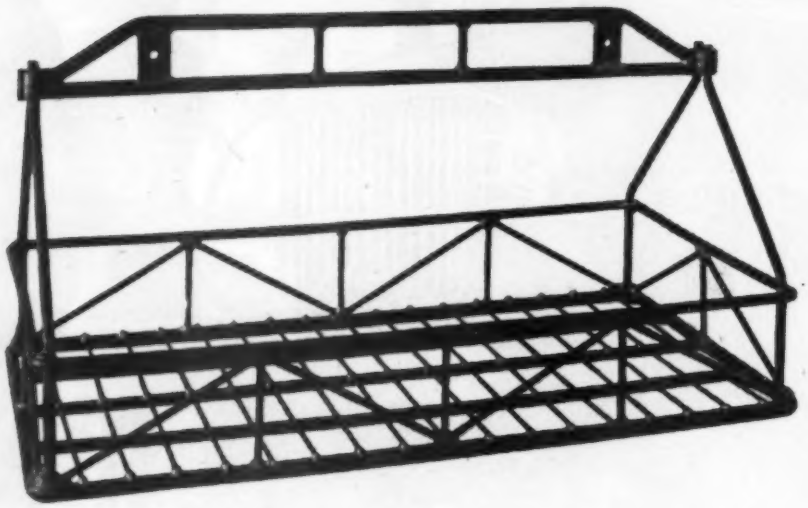
* Nickel *

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

BIGGER PAY LOAD LONGER SERVICE

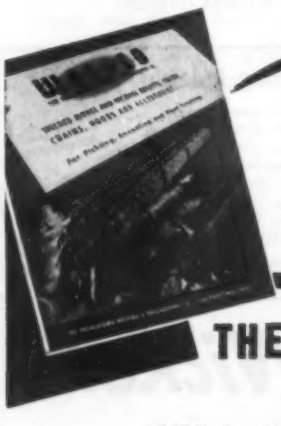
Again, WELDCO Crates
Replace Wooden Crates

GREATER SAFETY



The WELDCO pickling crate pictured above is being used by one of the world's largest and oldest shovel manufacturers. The crate is 64" long, 36" wide, with 12" sides and ends. It weighs 306 pounds and carries 1000 pound loads. Six Weldco crates in all were used to replace wooden crates in this plant.

Regardless of the type of product you are pickling — hollow and bulky articles such as cooking utensils, refrigeration and autobody parts, or small, heavy castings and stampings — The Youngstown Welding and Engineering Company can DESIGN and BUILD a long-life WELDCO basket or crate for you. They will be all-welded of Monel, stainless, or other alloys . . . whichever best fits your requirements. Merely tell us your needs . . . your inquiry will be answered promptly.



WRITE TODAY
FOR YOUR COPY

WELDCO

THE YOUNGSTOWN WELDING & ENGINEERING CO.

3714 OAKWOOD AVE., YOUNGSTOWN, OHIO

administration. In companies facing the overwhelming task of mutual adjustment of thousands of women to war industry, the hiring of specialized employee counselors has seemed a necessity. Employee counselors have helped to mold thousands of new employees into better and more satisfied workers.

But the effect of specialized employee counseling upon management organization in war industries is subject to serious question. One of the weakest segments in many industrial organizations today is the first line supervision. Yet the foremen is the nucleus around which effective personnel management must be integrated. More and more specialized functions must operate through him and not around him. Employee counseling must prove whether or not it has a permanent place in an integrated management organization.

Decentralization Speeds Subcontracting

IN THE UNITED KINGDOM—the Ministry of Production has set up regional "Capacity" offices to speed arrangements for subcontracting. The Ministry explains the program in a series of full-page advertisements:

"Solve your subcontract problems by one telephone call.

"Your District Capacity Office will give you, usually in a few hours, the name of a firm ready to do the job and the name of the executive who will handle it.

"Your inquiry is handled by people who understand your problems and talk your language. There are no forms to fill out, no charge, and no delay."

Case examples of the Capacity Offices' work are carried in the ads. In one case a few steel castings were needed to repair a lift bridge. The Capacity Office provided the name of the firm that could supply the particular castings in the least possible time.

In another case it was necessary to replace worn valves in a captured German ship. An appeal to the regional Capacity Office produced quickly the name of the firm best able to forge and machine the particular valves from a special gun steel in stock. By the time the vessel got to port the valves were ready for fitting.

In another example cited, large diesel engine cylinder liners, 3 ft. long and 2½ ft. in diameter, were found to be 0.010 in. under size in bore. The District Office, a few hours after the inquiry, was able to locate a firm that could start grinding the bores to size immediately.

The District Offices also arrange for the location of spare parts. The twelve regional offices are located in the principal cities of England, Scotland, Wales, and Northern Ireland.

What McCASKEY Control will do for you...

Experiences in hundreds of plants, large and small, employing from a few to many thousands, prove that McCaskey Tool Crib Control . . .

1 Reduces crib inventories

2 Eliminates loss and theft of tools

3 Reduces breakage to an absolute minimum

4 Quickly locates all tools whether in the crib or in possession of workmen

5 Speeds crib service reducing non-productive waiting time of workers and machines

6 Reduces tool clearance time of departing employees to a fraction of a minute

7 Definitely records employees' responsibility for tools, preventing disputes when tools are returned or workers quit

8 Is operated with minimum crib personnel; inexperienced attendants of either sex trained in about one shift

9 Is easily installed in busiest cribs and plants; initial investment and operating expense quickly repaid

10 Provides for inspection and, when necessary, reconditioning of used tools before replaced in bins

11 Shows how long workmen retain tools; prevents keeping more than necessary at any time

12 Provides perpetual inventory and record of tool activity for elimination of obsolete tools and reduction of excessive inventories

13 Gives you facts justifying or denying necessity for tool purchases

14 Provides reliable data on life and comparative performance of brands and types of tools

15 Gives you accurate basis for allocation of tool expense to various departments

Your Tool Cribs— "CUSTODIANS of PRODUCTION EFFICIENCY"

Here's an idea for every plant operating a tool crib, borrowed from an article on their cribs in a recent issue of Bell Aircraft Corporation's splendid house organ, *The Bell Ringer:*

"If a worker has checked out a special tool from the Crib, locked it in his tool box and gone home, the entire production schedule can be held up if that tool is needed and can't be located.

"It's no easy task — keeping track of 350,000 pieces of equipment, some of them so small that two hundred could be held in the palm of your hand, some of them weighing as much as two tons. Yet, that's what the Tool Cribs have to do. They keep track of the tools by means of the McCaskey System, a comprehensive record which indicates at a glance where every tool should be.

"The Tool Cribs are more than huge storehouses of vital equipment. Their personnel is more than a group of filing clerks and guardians over valuable property. They are the *custodians of production efficiency.*"

Tool Cribs operated with obsolete checking systems usually are gems of inefficiency. Missing tools create confusion and delay production. Employees waste time at the crib windows and the idle time of machines mounts up.

Whether you have one or twenty, make your cribs "Custodians of Production Efficiency" . . . with McCaskey Tool Crib Control.

Let us have a representative explain how McCaskey Tool Control can be installed in the busiest cribs without disturbing production in the least—or send you factual reports on McCaskey savings in several well known plants.

●

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

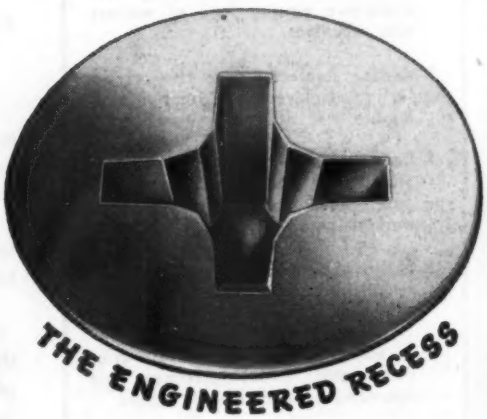
McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

IT'S LIKE GIVING YOUR ASSEMBLY LINE A SHOT IN THE ARM

TO SWITCH TO THE SCREWS WITH THE ENGINEERED RECESS THAT SPEEDS UP ASSEMBLY AS

MUCH AS 50% IT'S PHILLIPS



Manufacturers in every industry can tell you that switching to Phillips Recessed Head Screws acts like a tonic to assembly lines.

To start with, you get faster – *much faster* – screw driving. Comparisons made in scores of plants prove that Phillips Screws step up fastening speed as much as 50%.

Next, Phillips Recessed Head Screws save precious man hours. The scientifically Engineered Recess utilizes the worker's full turning power and skill. Time and muscle are not wasted on wobbly starts, slantwise drives and dangerous driver skids – nor on correcting sloppy work.

Finally, with all this increased speed, you get vastly better workmanship. Phillips Recessed Head Screws make driving so simple, so steady that the most inexperienced operator soon becomes master of the trickiest fastening jobs!

If these are the kind of results you'd like, but aren't getting from slotted and other type screws, you owe it to yourself and to your workers to switch to Phillips – the screws with the *Scientifically Engineered Recess.* They cost *less to use* ... because they help you *produce much more.* Any one of the 23 manufacturers below will enable you to prove it in your own plant.

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

Faster Starting: Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for green hands.

Faster Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

Easier Driving: Turning power is fully utilized. Workers maintain speed without tiring.

Better Fastening: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.

IDENTIFY IT!

Center corners of Phillips Recess are rounded . . . NOT square.

Bottom of Phillips Recess is nearly flat . . . NOT tapered to a sharp point.

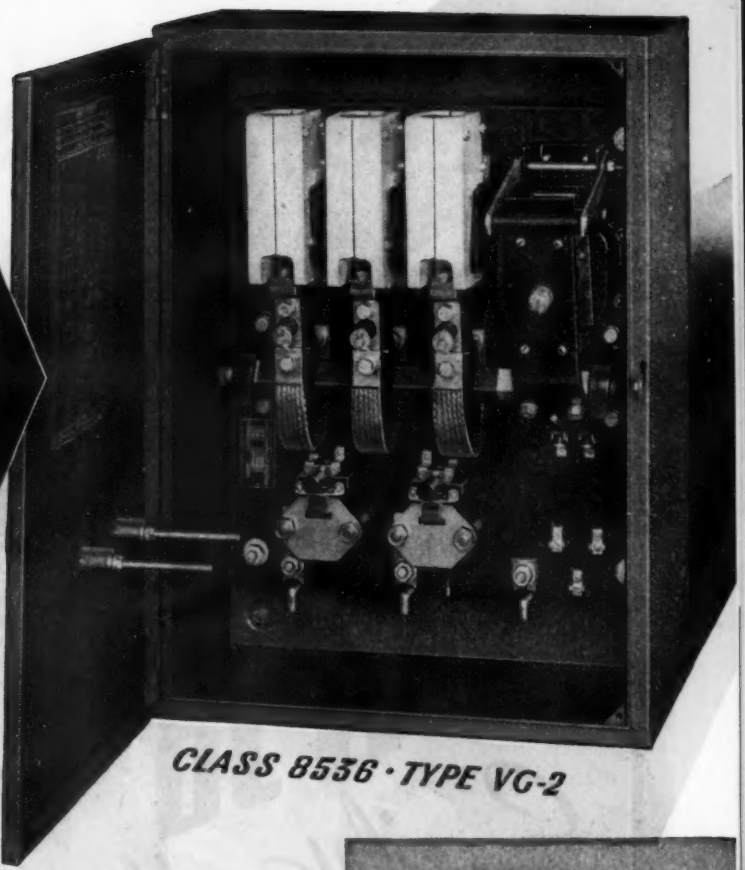
PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS · MACHINE SCREWS · SELF TAPPING SCREWS · STOVE BOLTS

23 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtaxket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Wolverine Bolt Co., Detroit, Mich.

AN *Improved* SIZE 4 STARTER WITH FIVE NEW FEATURES



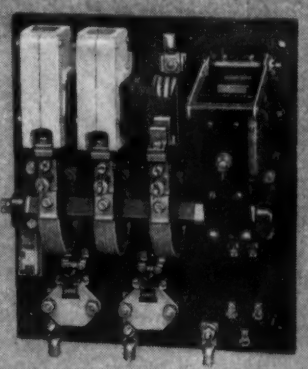
CLASS 8536 · TYPE VG-2

----SMALLER-QUIETER-----

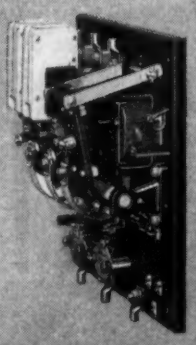
1. Improved blow-out coils have fewer turns and are wound with heavier copper—assuring less heating effect, and efficient interruption of stalled rotor currents for electric motors up to 100 horsepower.
2. New and larger magnet of modified **"E"** type construction gives added efficiency.
3. Self-aligning, floating armature eliminates vibration noise—reduces heating and magnet wear.
4. New shading coil affords exceptional mechanical strength. This coil is held in place by the magnet coil in such a manner as to prevent its falling out. Use of heavy brass ribbon makes shading coil virtually unbreakable.
5. Narrower panel saves space and flat door cabinet permits gang mounting.

• • •

This greatly improved Type V device is available in a complete range of enclosures for all Size 4 starter applications, including reversing, combination, multi-speed, reduced voltage, etc. Call in or write your nearest Square D Field Engineer for complete information.



Open type starter panel with one arc chute removed to reveal contacts and blowout coil.



Side view of panel shows "E" type magnet, floating armature and new shading coil.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

an element of Victory

OH 38

Easily Machinable

An Aluminum Alloy—Non-Heat Treated. The perfected metal that surpasses all others for a wide variety of machining operations. Non-corrosive—Easy on machine tools—Holds threads without stripping. Its light weight reduces table and machine loads and increases tooling accuracy. 5 years of proven superiority in hundreds of plants. OH 38 is an exclusive Hedstrom product.

Write for Literature

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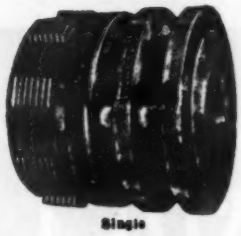
OSCAR W. HEDSTROM CORP.

4812 West Division St., Phone Columbus 3667, Chicago, Ill.

Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications

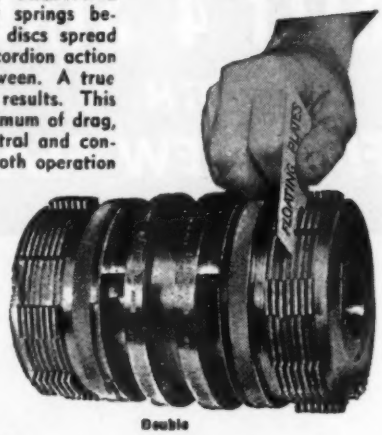
THE JOHNSON FRICTION CLUTCH

MINIMUM DRAG ASSURES COOL RUNNING WITH THE NEW "MAXITORQ"



Single

In the design and construction of the "MAXITORQ" MULTIPLE FLOATING DISC CLUTCH, separator springs between each pair of inner discs spread these endways with an accordion action so that there is space between. A true floating type construction results. This feature accounts for a minimum of drag, abrasion or heating in neutral and contributes to remarkably smooth operation as well as quick disengaging.



Double

Other features of performance and operation include simple manual adjustment, sensitive starting, safety and quietness. Heat and abrasion, ordinarily inherent in many clutches of the multiple disc type are eliminated in the "MAXITORQ."

Send for dimension sheets and specifications covering the sizes and types available.

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 64 OR CONSULT SWEET'S OR THOMAS' REG.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

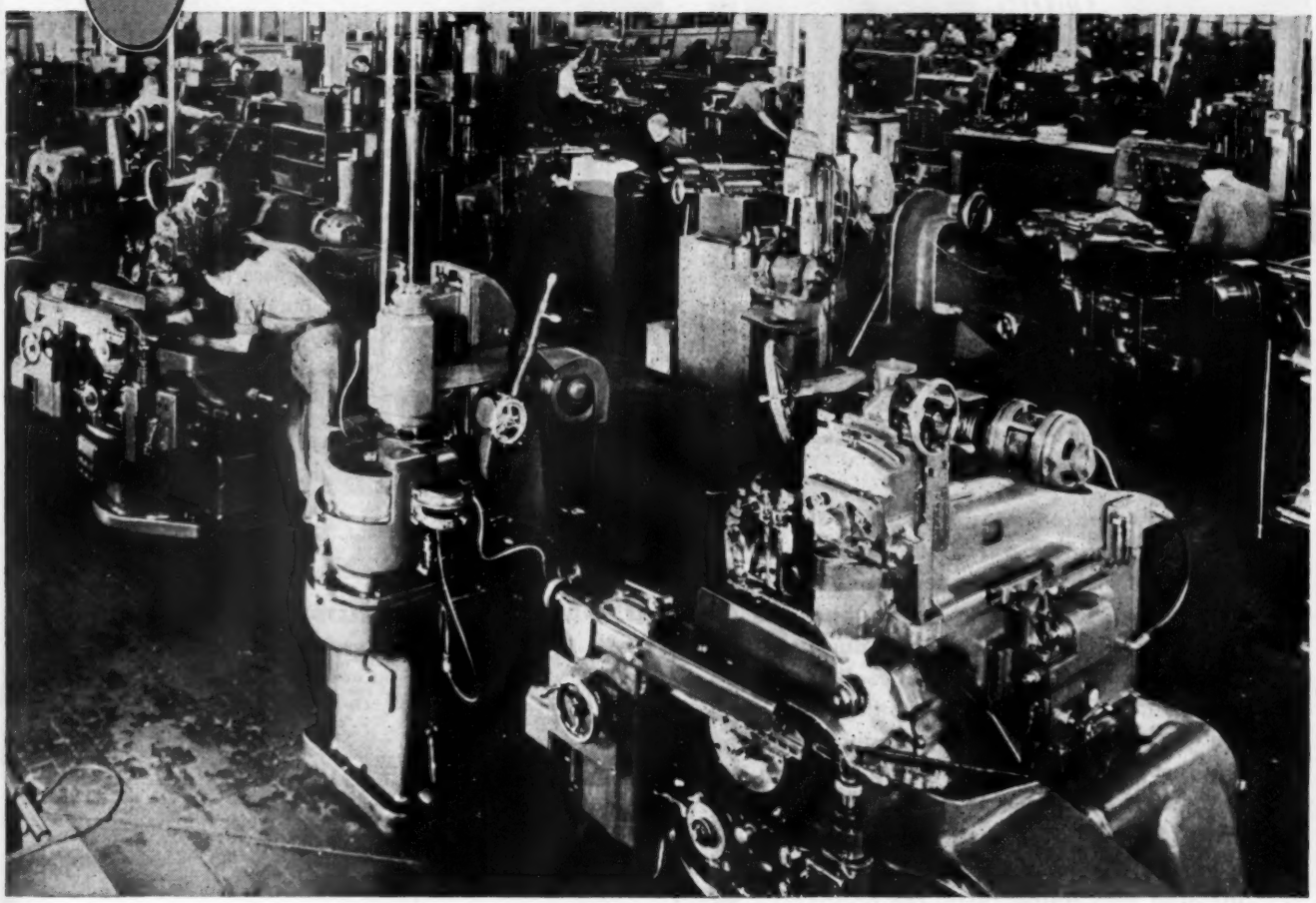
WATERBURY STEEL BALLS

THE WATERBURY STEEL BALL CO. INC.

U. S. A.

MAIN OFFICE: POUGHKEEPSIE, N. Y.

CORRECT Lubrication means Better Maintenance



CORRECT lubrication makes for better maintenance by preventing excessive wear.

Sinclair provides a range of specialized hydraulic, spindle, gear, and general purpose oils for *correct* lubrication of *MACHINING* equipment . . . also a widely diversified line of cutting oils adapted to every problem.

Where overtime heavy duty operation threatens excessive wear and machine stoppages there is a lubrication problem. Consult us about it.

(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

SINCLAIR INDUSTRIAL OILS

FOR *FULL INFORMATION OR LUBRICATION COUNSEL WRITE* SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

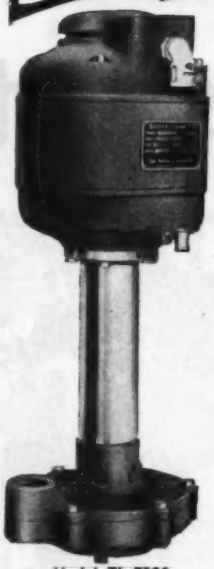
STA-KOOL
TOOL HOLDER

This new, patented diamond tool holder provides a fast, accurate method of meeting every requirement in dressing and truing operations. Equipped with internal coolant ducts for wet grinding, and external cooling fins for dry grinding, metal setting as well as stone are kept at safe operating temperatures, eliminating diamond breakage, due to overheating. Thus, tool life is increased, resulting in savings from 30 to 50% in diamond dressing and truing costs. For finish-dressing SMITITE Diamond Tools are available, in which the stones may be completely consumed without resetting. *Catalog on request.*

J. K. SMIT & SONS

157 Chambers St., New York 7, N.Y. 6400 Tireman Ave., Detroit 4, Mich.

Simplest Design
MINIMUM MAINTENANCE
GUSHER
COOLANT PUMPS



Model TL-7320.
See Section 2 of new catalog, indexed for quick reference.
Gusher Pumps Patented and Patents Pending.

Plant records of some of the country's largest factories show that Gusher Coolant Pumps require minimum maintenance. This is due to the simple design, with few parts and no bearings within pump itself, elimination of all packing nuts, no metal-to-metal contact, no relief valves. The result is less friction, less wear, longer life, minimum maintenance. From a dribble to 200 g.p.m., with no leakage — 1/30 to 2 H.P., there is a Gusher model and type for your special needs.

Write for catalog.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI 2, OHIO
The "Gusher"—A Modern Pump for Modern Machine Tools

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers, Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

Let's
BACK THE ATTACK
By Buying **WAR BONDS**

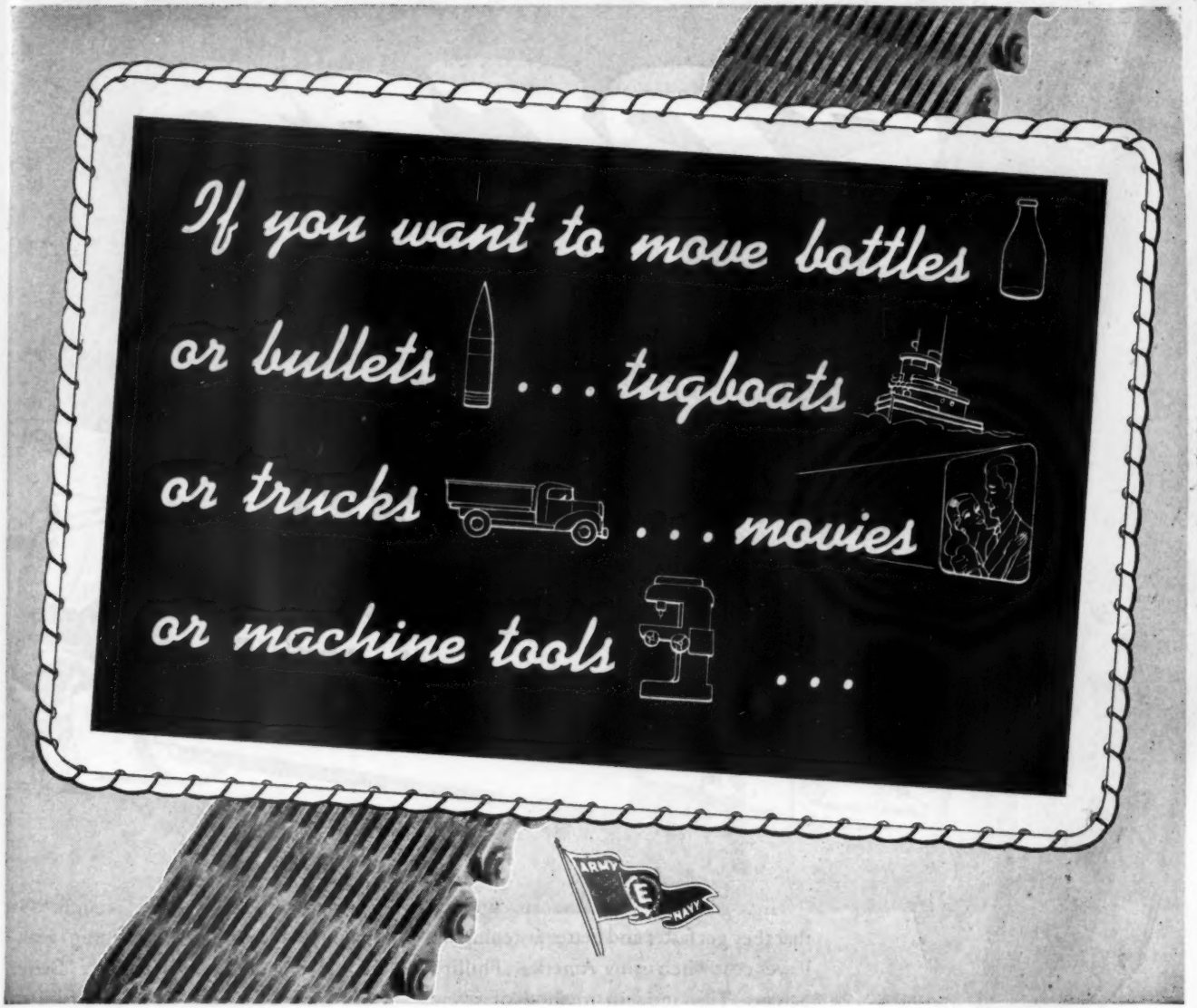
NEED CONTRACT WORK?

Investigate the possibilities offered you through advertising in the CONTRACT WORK SECTION!

For details, write

DEPARTMENTAL STAFF

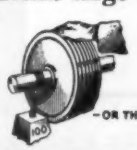
American Machinist, 330 W. 42nd St., New York 18, N. Y.



In fact, to transmit power to almost any application, the odds are that you can do it most efficiently with Morse Roller or Silent Chain Drives. Because they can't slip, Morse Chains, designed to the job, are ideal for conveyor use, moving bottles surely and accurately to filling and sealing stations. Because they're flexible and deliver power at practically 100% efficiency, Morse Chains have been widely accepted for marine reduction and power transmission usage in U. S. Navy craft . . . and for direct power transmission on trucks. Selected for the accuracy and precision with which they transmit motion, Morse Chains are used to turn the spools of movie projectors, to operate machine tools.

For the design engineer who thinks ahead, Morse Chain can open new vistas . . . as a flexible, precise means of transmitting power, without power loss, with exceptional accuracy. Consult your nearby Morse man about power transmission problems large or small.

Here's Why -



Teeth Not Tension

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *Roller and Silent* CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

SPEED

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AMERICAN PHILLIPS SCREWS

WORLD'S EASIEST, FASTEST, MOST ACCURATE METHOD OF PRODUCTION SCREW DRIVING

High-geared war plants are finding that they get faster and better fastenings at lower cost when using American Phillips Screws. This modern method of screw driving is faster because it's easier . . . because it permits use of power drivers on almost every type of assembly. There is no time lost in fumbled starts and dropped screws. The self-aligning fit of the 4-winged driver in the recessed screwhead makes it easy to drive this screw straight . . . straight to a tight, clean fastening without marring the work surface. Better work can be done even with unskilled labor *right from the start.*

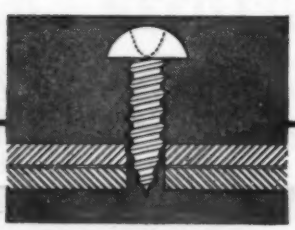
And when you specify the American Phillips Screws, you also get the extra values of American's high quality and service . . . as well as the help of American engineers on any special fastening problem.

AMERICAN SCREW COMPANY

Providence 1, Rhode Island

Chicago 11, 589 East Illinois Street Detroit 2, 502 Stephenson Building

American Phillips Hardened Self-Tapping Sheet Metal Screws are made in Type A (Gimlet Point) shown, Type Z (Blunt Point), and Type C (Tapered Point).

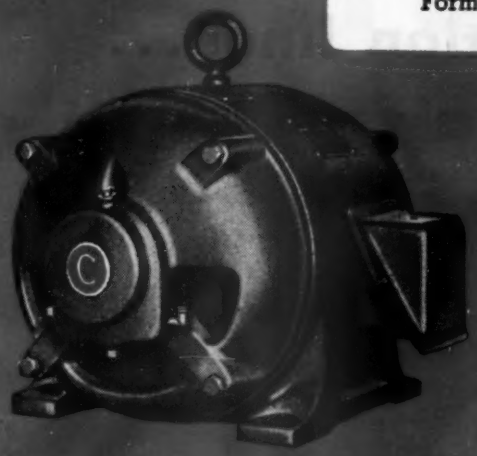


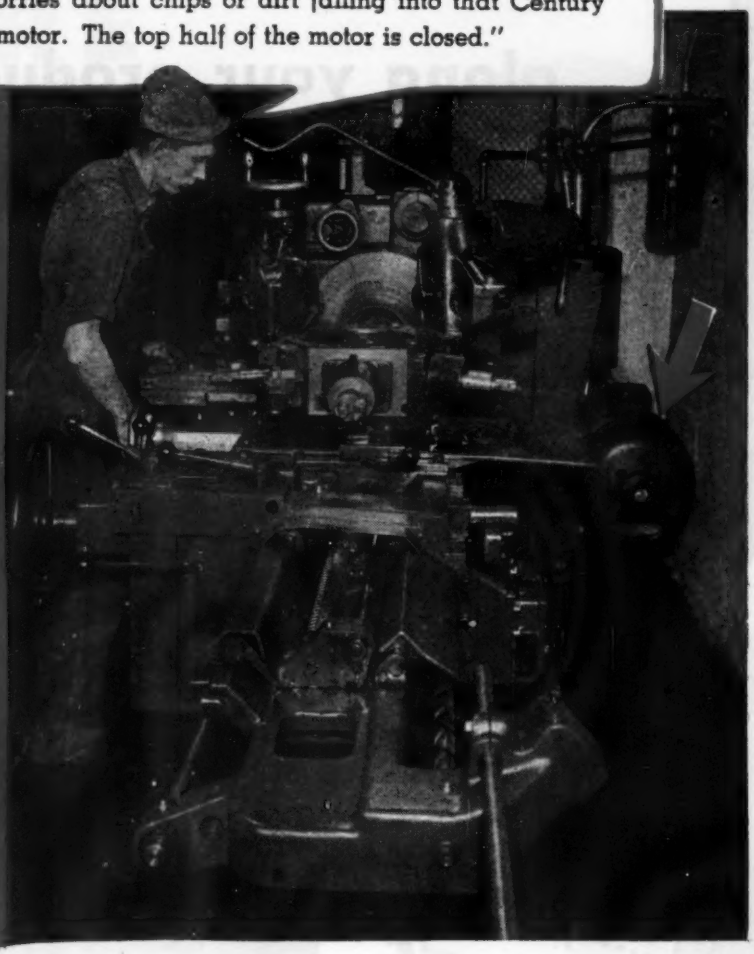
American Phillips Driver and Screw form a single, straight-line driving unit . . . and stay that way until screw is completely driven in.

American Phillips Hardened Self-Tapping Sheet Metal Screw sets up tight and straight in drilled or clean-punched holes.

PUT THE SCREWS ON THE AXIS . . . BUY BONDS!

"I've no worries about chips or dirt falling into that Century Form J motor. The top half of the motor is closed."





the Extra Protection of CENTURY FORM J MOTORS

Gives You Long Motor Life

Look at the 10 horsepower Century Form J motor on the lathe in the illustration above —— you can see how falling chips would bounce off the motor frame should they fall on it.

When the motor is mounted below the work level, this construction minimizes the possibility of falling solids or dripping liquids entering the operating parts of the motor.

Adequate ventilation to compensate for the partial enclosure is provided by fans on each end of the rotor to force a blast of cooling air around the bearings and ventilating passages surrounding the winding.

It will pay you to get complete information on all the advantages of these modern Century motors for today's production requirements and tomorrow's needs. A Century engineer will be glad to help you select the right motor. Call him in.

Century C MOTORS

377

CENTURY ELECTRIC COMPANY, 1806 Pine St., St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Do some "Victory Gardening" along your production lines...

To get the utmost *or even extra* yield from every row of war-production machines, try some intensive cultivation with Facts in Figures as your trusty gardening tools:

These facts, continuously supplied by Veeder-Root Counting Devices on each machine, show you any production *which you are not getting*, and so enable you to make the mechanical or power adjustments that *will* get it. These facts, too, warn of approaching routine maintenance needs. And they make it possible to co-ordinate all machine-departments more closely, so that final assembly can roll more smoothly and swiftly.

Veeder-Root Counting Devices are compact . . . easy to install . . . made in different types to count any unit of machine-performance either mechanically or electrically. Find out how much more yield they could dig up for you, out of each production line. Write.

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THINK OF THIS PICTURE

when ordering rivets

It shows Buffalo Bolt Company's capability of producing rivets of practically any conceivable size or shape to meet your war time problems—or to help in your postwar designing.

BUFFALO BOLT COMPANY

NORTH TONAWANDA, N. Y.

SALES OFFICES IN PRINCIPAL CITIES

One of the modern rivet making machines of the Buffalo Bolt Company

CHICAGO

"SAFETY PLUS" SOCKET SCREWS

are accurate to the Nth degree

Machining on modern precision equipment designed and built to maintain the closest production tolerances, plus inspection after each operation on the latest type automatic gauging devices—adds up to a uniformly accurate product ideally suited for quick and trouble-free assembly . . . All Chicago "Safety Plus" Products are manufactured from electric furnace, controlled grain size alloy steel. The complete line includes socket set screws, socket cap screws, pipe plugs, stripper bolts, and square head dog point set screws. Specify Chicago "Safety Plus" Socket Screws.

These Fine Products are sold only thru Authorized Distributors

THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 So. Homan Avenue Chicago, Ill.

Alert to buyers' needs, Thomas will gladly assist you in your search for new and better ways to do things. Since Thomas has facilities for a wide range of mill practices, it can give you cold rolled strip steel with unusual characteristics. Careful Thomas production provides a uniform and dependable raw material with which to work . . . with it you can speed your production to meet intensified quality competition now and in the future.

Thomas Strip

COLD ROLLED STRIP STEEL

BRIGHT FINISH NOT COATED, SOLDER COATED, ELECTRO-COATED WITH NICKEL, ZINC, COPPER, BRASS, AND LACQUER COATED—IN COLORS

THE THOMAS STEEL CO., WARREN, O.

SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

NEW 3/8"—2, 3, or 4 WAY AIR VALVE

FEATURES

1—Hinged armature operating magnet
2—Slide valve type
3—Valve parts removable without any piping disturbance
4—Bronze valve body
5—Nitralloy valve plunger
6—Air leakage cannot cause pressure build-up in "off" cylinder
7—Continuous duty operating coil
8—Pipe Connections available in bottom or through the side.

★ "3C" Bulletin 5740 Magnet Operated Valves are designed for use on air operated welders, tools, etc.

The hinged armature magnet has very little movement, and a minimum of pounding. It is a slightly modified standard "3C" magnet which has been used for years as a heavy duty contactor operator.

This sturdy valve is designed to give 400 operations per minute. Ample size of bronze stationary valve body and nitralloy moving plunger provide long life with little wear.

For complete details ask for Bulletin 5740

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FIGHTING STARS OVER BERLIN

There they go again . . . American bombers over Berlin. Guided by star American pilots . . . manned by star American crews . . . powered by star American engines . . . produced by star American workers.

For these fighting planes over Europe and other theatres of war, Lawson workers have contributed many types of precision aircraft engine parts. Lawson employees, star workers in the battle for victory, are again being honored for their long record of war production.

This new fighting star which adorns our "E" pennant marks the third citation received for meritorious war service in a highly specialized field. Lawson workers dedicate themselves anew to the task of producing star war materiel to bring the day of victory closer.

FIRST "E" AWARD April 29, 1943 | SECOND "E" AWARD October 30, 1943 | THIRD "E" AWARD May 17, 1944

LAWSON

Established 1933

Machine and Tool Company

MALDEN, MASS.

MANUFACTURERS OF PRECISION MACHINE TOOLS AND AIRCRAFT ENGINE PARTS

GRANT GEARS

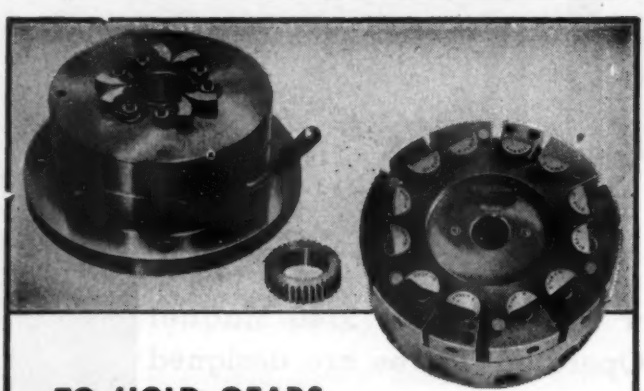
"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

GRANT GEAR WORKS

BOSTON, MASS.



TO HOLD GEARS

with precision for boring or grinding

HAVE TEETH GRIPPED ON LINE OF ACTION

Principle used only in

MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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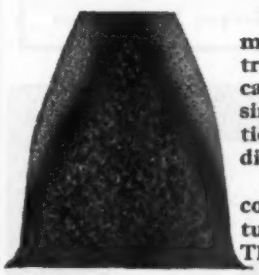
LeMaire Tool & Manufacturing Co.

2665 So. Telegraph Rd., Dearborn, Mich.

makes gear teeth wear better... last longer and transmit more power



Yes, two to three times the power will be transmitted by a surface hardened gear over an untreated gear of the same size. With small gears case hardening will satisfactorily produce the desired surface hardness. However, this is not practical for large gears because of the relatively high distortions, so Flame Hardening was developed.

In flame hardening of Philadelphia Gears the core of each tooth remains unchanged in structure since the heat penetration is controlled. The cross-section cut at the right shows the pattern of hardness obtained. Note that all of the wearing surfaces are hardened.

No measurable distortion can be found in surface hardened gears. Tooth bearings have been repeatedly checked before and after surface hardening and show no change.

Our Catalog No. 42 gives further details on flame hardening, and also describes our complete facilities for manufacture of industrial gears of all types. Write for a copy on your business letterhead.

Philadelphia GEAR WORKS INCORPORATED

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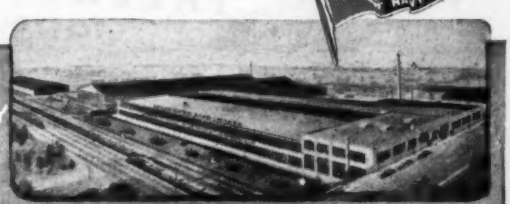

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Gear Specialties

SPURS • HELICALS • BEVELS
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WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

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GEAR CUTTING MACHINES

New Design
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EACH GEAR A MASTER GEAR

and the way MEISEL builds gears, there's just one *right* gear for any specific job. Designed for use under conditions that exist, MEISEL Gears actually "belong" to a machine . . . are inherently able to give longer, quieter, more economical service. Investigate the advantages of *specifically* engineered gears by MEISEL.

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can be changed by merely changing the pinion.

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GEARS • CAMS
THREAD GRINDING
. . . TO YOUR SPECIFICATIONS
When you come to "HARTFORD" you get what you order—without delay—at reasonable cost.
Send specifications—ask for quotations.
THE HARTFORD SPECIAL MACHINERY COMPANY
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Sier-Bath Precision Gears

Must be made right to mate right

● Meticulous care such as checking mating gears on centers is characteristic of every detail in Sier-Bath production. That is why gears produced in the modern Sier-Bath plant are recognized everywhere as "precision gears."

Early deliveries can be made on gears to your specifications.

SIER-BATH GEAR CO.

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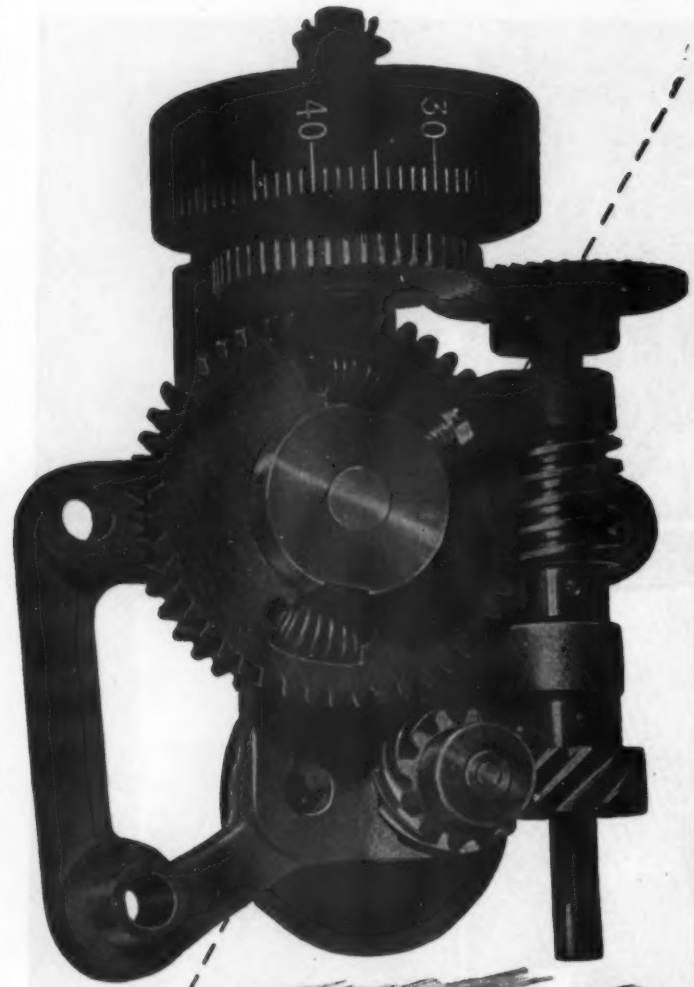
The Doorway to 38 years experience in making Precision Gears



FLIGHT No. 4 REPORTING

In base to plane communication one of the vital contributing factors toward the accuracy of pin point tuning is precision gears, and we are proud to say that QUAKER CITY GEARS are playing their part in assuring this accuracy.

Quaker City Gear Works
INCORPORATED

1910-32 NORTH FRONT STREET, PHILADELPHIA, PENNSYLVANIA

FROM EACH POINT OF VIEW
Cincinnati Gears
HAVE MUCH TO OFFER

- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPECIAL

THE DESIGN ENGINEER using Cincinnati Gears has all the advantages that permit wide flexibility of design coupled with proven accuracy, performance and dependability.

THE MANUFACTURER finds many production advantages in Cincinnati Gears. These *Gears —Good Gears Only*, because of their higher degree of uniformity assure the manufacturer of faster and more efficient production.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
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TO HELP NEW EMPLOYEES BECOME SKILLED OPERATORS

No. 5 in the series of special training sections on "Tools of Our Trade," appearing originally in *American Machinist*, this 16-page illustrated booklet presents a summary of the facts about the process, the machines and tools in the field of grinding. Will help reduce training time. Reprints available at 10c each; less in lots of over 500. Use coupon below.

MAIL TODAY TO AMERICAN MACHINIST

AMERICAN MACHINIST, 330 W. 42nd St., New York 18, N. Y.
Please send me.....copies of "How to Run a Grinding Machine."
Enclosed is $.....(in stamps, ebook, money order).
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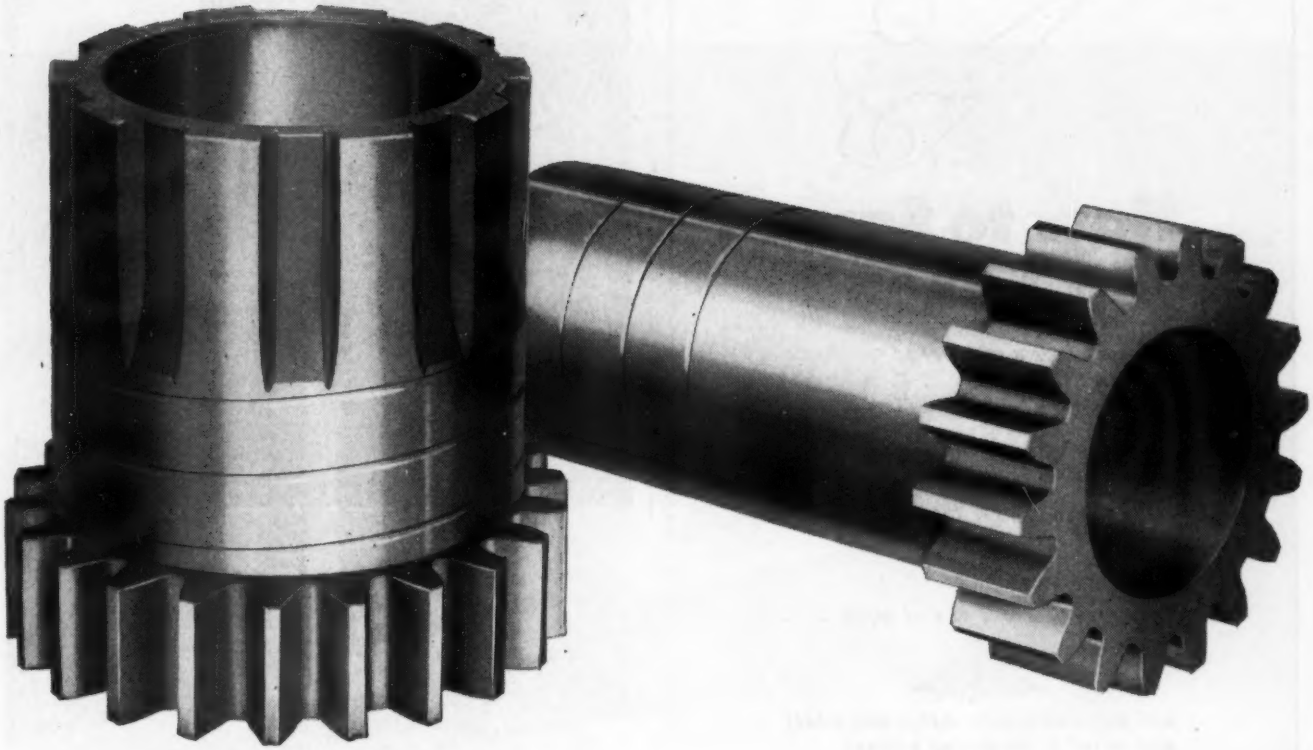

Gears *to your specifications*

Spur Gears
Helical Gears
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Worms
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Miter Gears
Sprockets
Ratchets
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Lead and Feed Screws

Adams Gears are produced with the finest production and inspection equipment obtainable and they can be furnished to your most exacting requirements.

THE ADAMS COMPANY

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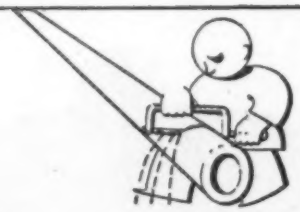
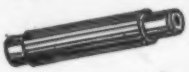
1883 — Our 61st Year — 1944



How to Save By Sawing

When you bore a solid bar of tool steel to make a tubular part . . .

you get two things: the part itself . . .



and a pile of scrap . . .

and you waste time, manpower, money and metal in the boring process.

●

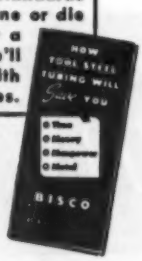
But when you make your part out of **BISCO** *tool steel tubing . . .*

You get the part you want
—exactly as you want it
—with no waste at all.

SO—

Let's saw instead of boring!

BISCO non-shrinkable, oil-hardening tubing is made to exacting standards for the most precise machine or die construction. It is used for a great variety of parts, and we'll be glad to supply you with further information on its uses.



SEND TODAY FOR THIS FOLDER →

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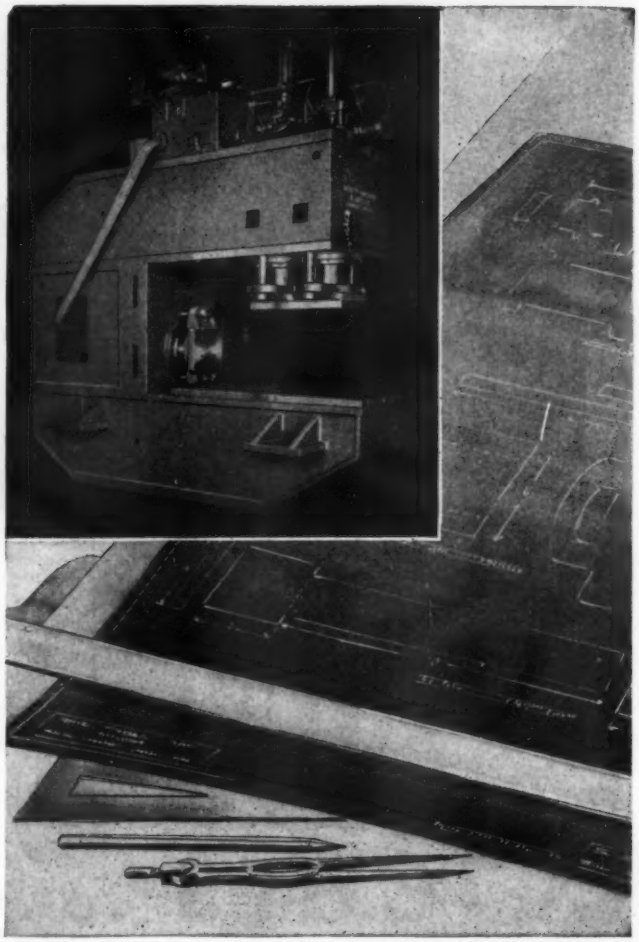

We Build Something in . . . That's NOT on the BLUEPRINT!

This is the Beatty 400-ton Hydraulic Forming and Flanging Press. Specifications call for finest quality materials and workmanship, advanced design principles, and special features such as a self-cooling oil circuit. But the most important part of this machine is the modest nameplate that reads — B E A T T Y. That name is your assurance of performance as promised. You'll find the BEATTY nameplate on a complete line of hydraulic and mechanical punches, presses and shears, designed for heavy metal fabrication. Write us for complete information on your requirements.

HYDRAULIC HEAVY METAL WORKING EQUIPMENT

BEATTY MACHINE & MFG. COMPANY
HAMMOND, IND.

FOR PRECISION WORK . . .
IN VOLUME LOTS . . .
AT LOWER COST

"Ask ETNA about Swaging"

● Here is a job done on a standard ETNA Swaging Machine by a prominent midwestern manufacturer in turning out 20 m.m. shells. The operation consists of swaging a narrow copper band around the shell. This is but one of countless operations on which ETNA Swaging Machines can reduce costs.

FOR EXAMPLE—

Swaging can, in one step, often handle jobs that formerly represented two and three separate operations. Moreover, swaging improves the structure of metal—makes it stronger, harder, more dense and more elastic. Swaging also gives the work a burnished surface which is more resistant to wear and to corrosion.

Parts made by Swaging can be held within limits of plus or minus two to three thousandths of an inch in diameter, and frequently can be turned out on fully or semi-automatic machines at a high production rate.

Remember this: ETNA Swaging Machines can be quickly and easily converted to normal peacetime operations. ETNA Swaging Machines are built in ⅜" to 8" diameter capacities—1" to 18" die lengths. Larger units built to your order. Write, wire or phone —"Ask ETNA About Swaging" today!!

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING . . .
"Ask ETNA About Swaging"

ETNA
MACHINE COMPANY
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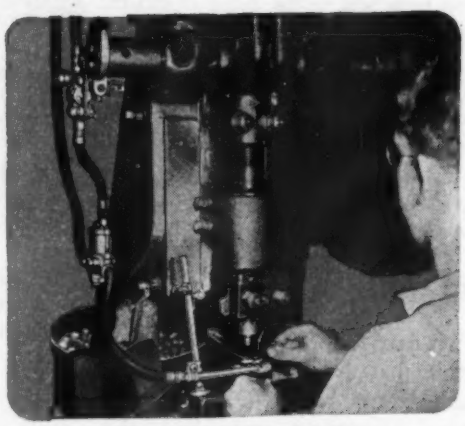
what's a windmill got that you need?

The power of air at work, originally suggested by the windmill, becomes a modern and vigorous factor in industry when compressed air is controlled by proper equipment.

Schrader, pioneer in elimination of air losses through the principle of controlled intermittent blasts instead of constant flow, has designed and brought to you a modern and effective complete line of devices offered for the control and use of air. In fact, with Schrader Air Controls, it is often possible to extend the use of air to many more devices or machines than you now have in service *without* increasing your air compressor capacity.

Schrader Air Ejection Sets are practical examples of air-saving Schrader controls. These inexpensive standard packaged sets can be installed in a jiffy with a few simple tools. You can profit right away by increased safety, increased production and less fatigue. Look into Schrader Air Ejection Sets now; their low cost will surprise you! Write for Bulletin A-8A.



Note how work is BLOWN into barrel.

SCHRADER AIR EJECTION SETS, operated from either cam or ram, are adaptable to many types of presses and machines, and adjustable for a wide variety of air ejection jobs. Designed for ease of installation and maximum economy of operation.

100th ANNIVERSARY 1844 1944

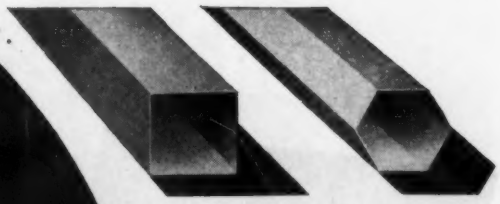
Air Valves 2, 3, 4-way • Machine Operating Air Controls • Quick-acting Couplers • Blow Guns • Safety Operating Controls • Air Ejection Sets • Hydraulic Gauges

ARMY-NAVY E

MADE BY THE MAKERS OF SCHRADER TIRE VALVES AND GAUGES

Schrader
REG. U.S. PAT. OFF.
CONTROLS THE AIR

A. SCHRADER'S SON, *Division of Scovill Manufacturing Company, Incorporated,* **BROOKLYN, NEW YORK**



Forming a 6-inch diameter cylinder on a Cleveland Steelweld Press. Machines can be furnished for forming cylinders in lengths up to 20 feet.

SMALL DIAMETER CYLINDERS QUICKLY PRODUCED

Small diameter cylinders, square and hexagon tubing and other closed shapes are easily made with simple dies on Cleveland Steelweld Presses. Special steel dies are usually used for large quantities, but for small numbers a steel male die and a female pressure pad made of rubber is often used.

A series of successive bends are made starting at the ends of the sheet and finishing with the center bend. The dies are so made that the cylinder or tube when removed from the machine will spring to a closed position.

This is only one of the dozens of different jobs that can be done on any Cleveland Steelweld.

GET THIS BOOK!
CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated

THE CLEVELAND CRANE & ENGINEERING CO.
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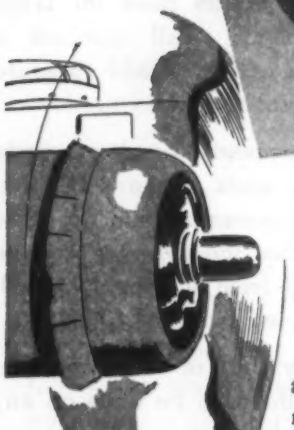
CLEVELAND
STEELWELD PRESSES
GENERAL SALES AGENTS: THE CYRIL BATH CO., E. 70TH & MACHINERY AVE., CLEVELAND



Presteel Aluminum Domes from Discs 0.450" Thick

Formerly hot forged of duraluminum alloy, these propellor hub domes are now cold formed from the new aluminum alloy No. 61, in massive Presteel presses. This progressive development, permitting the use of thinner walls, has resulted in aluminum savings up to 16 pounds per dome in some sizes — a huge amount on the total production.

These cold formed domes have high tensile strength and a greater resistance to corrosion than the former product.

Stamping to tolerances of thousandths of an inch or less is every-day performance at Worcester Pressed Steel Company. And more and more manufacturers are turning to Presteel for lower costs and better production. Have you investigated Presteel possibilities for your own products? Mail samples or prints to —

WORCESTER PRESSED STEEL CO.

206 Barber Avenue, Worcester 6, Mass.

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

A Mighty Thrust, a Lusty Shove
or just a Gentle Nudge

MODEL 6430
150-TON CAPACITY

Elmes Open Side Straightening Press with 96″ x 24″ bed, 17″ x 18″ platen, 32″ opening, and 20″ adjustable stroke. Speeds, in inches per minute: advance, 75; pressing, 12; return, 150. A rugged, self-contained unit with all-welded steel frame enclosing the direct-connected pump and piston cylinder; adjustable platen guides and convenient control. Spring-lifted work centers are adjustably tied together by a reinforcing cross rod.

ELMES STRAIGHTENING PRESSES
give you
SENSITIVITY AND PROPORTIONATE CONTROL
for Accuracy with Speed

Elmes hydraulic straightening presses are ideal tools for straightening steel castings, transmission shafting after keyseating or heat treating, gun barrels, forgings, crank and cam shafts—and for every other straightening job where speedy accuracy depends upon sure and instantaneous response to sensitive control.

These versatile machines are made in capacities from 12 to 600 tons, and larger. A high and low pressure pumping unit provides both rapid slide advance and correct pressing speed. All sizes are equipped with stroke control to limit movement as desired, and all are arranged to automatically return the slide to the selected "up" position when pressure is released.

Where parts to be straightened are too large for manual shifting, presses can be provided with a power-traveling table—an arrangement which also permits convenient setting and removal by crane. Suitable work-holding fixtures, designed to save time in setup, are supplied with each press.

The Elmes hydraulic straightening press has a thousand and one uses in any piece or production shop. This handy tool can be used for bending, to force in bushings, or to impose pressure upon any point of any part its rigid bed will accommodate—a pressure that always is under the full and accurate control of the operator.

For nearly a century, Elmes hydraulic equipment has solved the pressing problems of industry. Let this experience be your guide in planning pre-peace and post-war production. Our staff of engineering specialists is at your service with suggestions, recommendations and cost estimates on existing designs or new developments . . . gratis.

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Talk About PRODUCTION Without DIES!

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4,000 Parts Per Day With DI-ACRO Bender

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines,—Benders, Brakes, Shears. Picture shows the finished part formed to die precision, including acute right angle bend. Women operating DI-ACRO units maintain a high out-put on production work.

"Enclosed picture in our plant proves the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on request.)

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

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STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

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straight side press

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DIE SETS

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AUTOMATIC EQUIPMENT

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WALTHAM Cylindrical SUB PRESSES assure finer, more precise die work

OVERHANG TYPE SUB-PRESS

Waltham Sub Presses—available in arch and overhang types—can be depended on to produce work of uniform high quality. They are definite time savers because their accuracy and precise, clean cutting result in the production of stampings which are ready for assembly without additional finishing operations. Design and construction are such as to assure permanency of alignment. The plunger, babbitted inside barrel and the bearing formed has a tapered outside diameter adjustable for wear.

Made in sizes from 1.2" to 6" diameter plungers.

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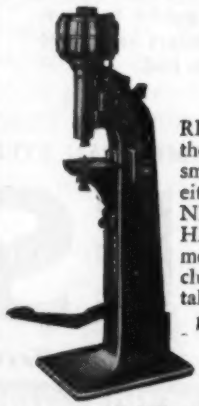

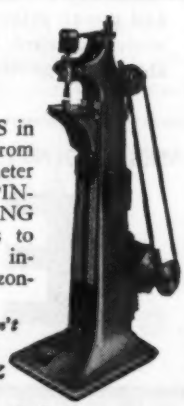

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Write for literature and don't forget to send samples.

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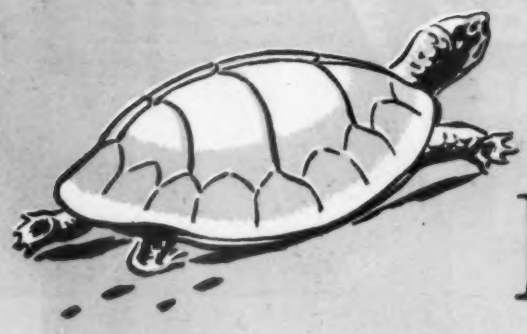

INCHING

Slow speed for inching, threading and close inspection of work in process is but one example of the versatility of Reliance motor-drive. Properly applied, motor-drive is more than power. In addition to controlled and variable speed, it can be the means of: smooth, controlled acceleration—automatic reversing, quick stopping—control of tension—tandem operation. With Reliance motor-drive these functions can be provided electrically, eliminating such mechanical devices as clutches and gears.

Reliance engineers have had wide experience in developing new uses for modern motor-drive and, in cooperation with plant engineers, adapting basic developments to specific industrial problems. Perhaps this experience can be usefully applied in *your* plant. It is available on request. Ask for Bulletin 311 showing application of an all electric adjustable speed drive for A. C. circuits.

RELIANCE ELECTRIC & ENGINEERING COMPANY

1088 Ivanhoe Road • Cleveland 10, Ohio

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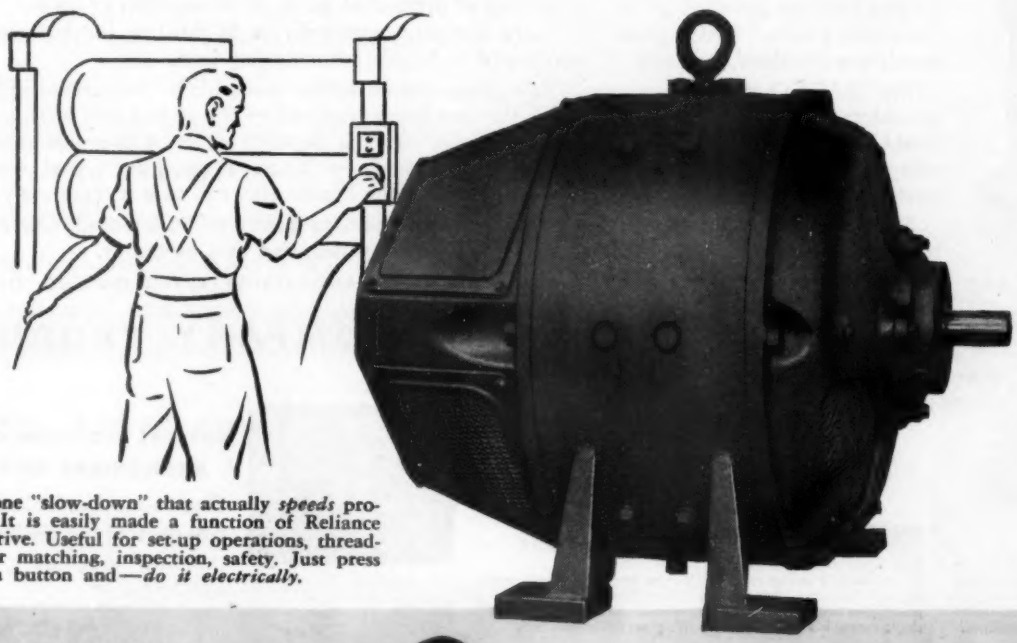


There's one "slow-down" that actually *speeds* production. It is easily made a function of Reliance Motor-Drive. Useful for set-up operations, threading, color matching, inspection, safety. Just press a button and—*do it electrically.*

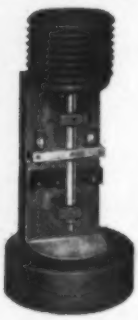
RELIANCE A·C D·C MOTORS

GENERAL CONTROL COMPANY

GAGE-O-MATIC

Special production gaging equipment

OFFERING MANY GAGING ADVANTAGES NEVER BEFORE AVAILABLE



The General Control Company's "GAGE-O-MATIC" is an automatic, electrically-operated comparison gaging machine for gaging large quantities of production parts, to thousandths of an inch, at desired dimension points. "GAGE-O-MATICS" are designed especially to fit the job, but the electric gage heads are standard, and can be rearranged to handle other gaging jobs.

The "GAGE-O-MATIC" has several advantages never before available — it can be used by machine operators to check volumes of parts *while they are being produced* — it is so fast that often *one* "GAGE-O-MATIC" can handle *all* inspection of an *entire* machine department — it prevents spoilage from piling up, to be caught later in the inspection department — it accepts good parts, and rejects spoiled parts, *giving the reason for spoilage* — it eliminates the human element, as it is completely automatic.

Send us samples and prints of your parts, with dimension points to be checked. Our engineering department will be pleased to give recommendations, prices, and time estimates.

SINGLE GAGE UNITS CAN BE SUPPLIED FOR SEMI-AUTOMATIC, MANUALLY-OPERATED GAGING OPERATIONS

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CAM LEVER SWITCHES

MODEL MCL-CS

For radio, radar equipment, communications and wherever electrical equipment is required. Unlimited contact possibilities.

MODEL MR ROTARY

One to six switch positions for complicated and unusual circuits. Unlimited contact possibilities actuated with a single control knob.

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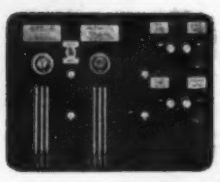
For safety, convenience and greater production. Send for handbook catalog No. 441 which gives full information.



SPECIAL ELECTRONIC AND ELECTRO-MECHANICAL CONTROL PANELS

Electro-mechanical and electronic control devices for packaging and plastic molding machinery, machine tools, etc., etc.

GENERAL CONTROL COMPANY

1200 SOLDIERS FIELD ROAD, BOSTON 34, MASS.

INCREASE YOUR MAN-POWER BY BETTER SELECTION OF . . . MACHINE-POWER

Metal Cut-Off Machine
Sliding ram travels 21½". Cuts all materials at any angle.
Radial Drill
Drills to center of 62" circle. Spindle speeds 160 to 8200 R.P.M.
15" and 20" Drill Presses
260 to 5200 R.P.M. Hand or power feed.
Metal Cutting Band Saws
14" and 16" Models 61 to 5300 S.F.M.
Polishing Lathe
For burring, polishing and hand-lapping.
Multi Spindle Drill Press
15" and 20" models, hand or power feed.

American industry has about reached the "bottom of the barrel" for man-power. Any required increase in production, therefore, must come from improved efficiency of present workers and their machines.

Alert manufacturing executives have substantially increased production with marked savings in power, capital investment and operating cost—by using fast, streamlined Walker-Turner Machine Tools on hundreds of jobs where heavier and slower equipment had been employed formerly. A few of these "speeder-uppers" are shown on this page. Send for Catalog.

WALKER-TURNER COMPANY, INC.
45123 Berckman Street, Plainfield, N. J.

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PLAINFIELD, N.J.
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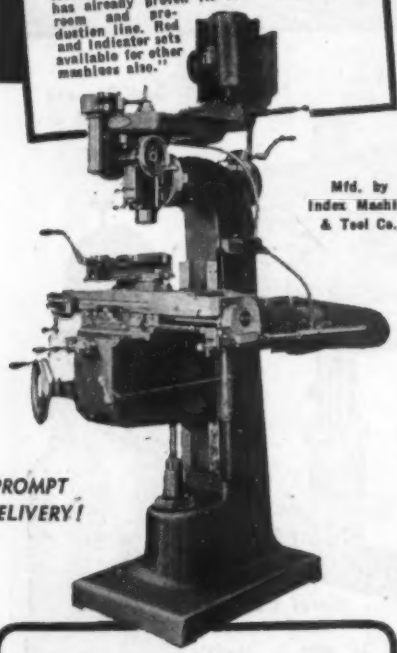
MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

NOW! INDEX MILLS

EQUIPPED WITH RODS & INDICATORS

"We are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001" two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8" x 16", and troughs for holding rods cross and longitudinal. This makes it possible for you to obtain, at an astonishingly low price, a precision locator as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and indicator sets available for other machines also."



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

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Less Wear

of vital frictional parts

..made with Ampco Metal

Foremost machine-tool builders (over 90 of them) insure the accuracy of their equipment by using Ampco Metal at critical points subject to wear from mating materials. This superior aluminum bronze alloy lasts several times as long as ordinary bronzes . . . provides controlled hardness, high tensile strength, excellent compressive strength, and stubborn resistance to wear, "squashing out," impact, corrosion. Check for this protection against costly breakdowns in the specifications of machines you buy. Insist that replacement parts for your older machines be made of durable Ampco. Write for "File 41 — Engineering Data Sheets."

Ampco Metal, Inc., Dept. AM-6A, Milwaukee 4, Wis.

Typical applications where Ampco Metal is essential:

- Actuating and Adjusting Nuts
- Apron Sleeves and parts
- Bar Feed Fingers and Nuts
- Bushings and Sleeves
- Wear Strips
- Brake Cone Shoe
- Cams & Bushings
- Chucking Fixtures and parts
- Clutch parts
- Shifter Forks & Racks
- Elevating Nuts
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- Thread Chaser Feed Nuts

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Metal M-6

The Metal without an Equal

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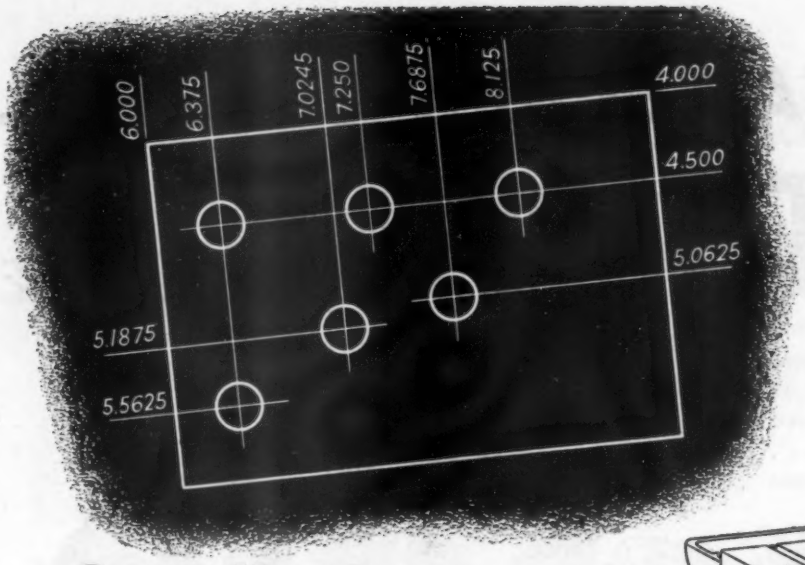
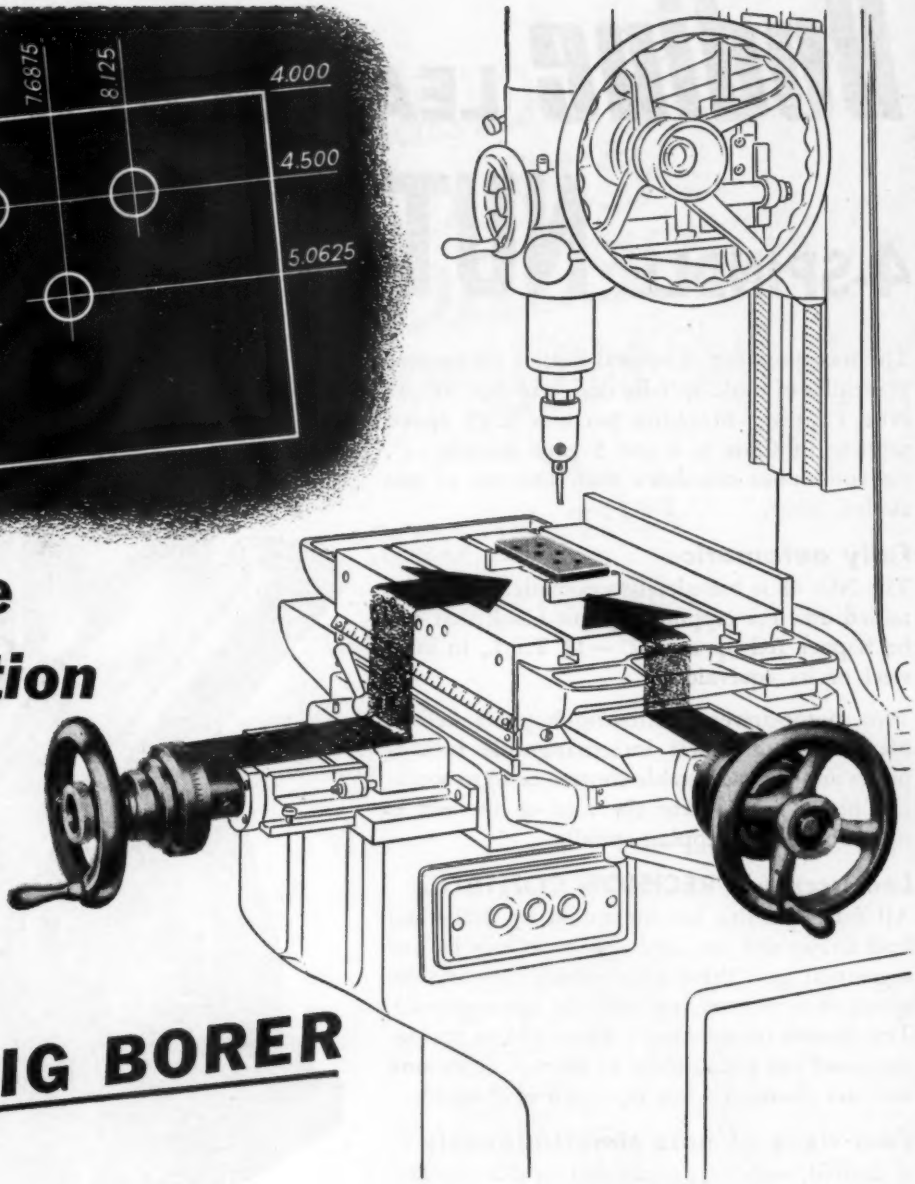


Coordinate Hole Location is at your Fingertips in the MOORE JIG BORER



SPOTS • DRILLS • BORES • REAMS
***All* Holes with Minimum Tool Changes**

A glance at your blueprint...a few turns of the lead screws and *all* holes on the work piece are quickly located and spotted—*consecutively, accurately.* It's as simple as that. There's no waiting for tool changeover on each individual hole, for the Moore Jig Borer drills, bores and reams *all* holes in the same rapid sequence with the minimum of tool changes.

Contrast this *built-in* system of coordinate location with the laborious size blocks or graduated scale methods of measurement, plus the continual stop-and-start required with tool changes at every hole. Then compare its production volume on your cost sheets.

Guaranteed to space and bore holes accurately within limits of .00025" in *any* position of the table, the Moore Jig Borer is ideally suited for jigs, fixtures, dies, gages and special machine parts. It is highly sensitive for holes of 1/32" diameter yet rugged for heavy cuts up to 4½"—and is ideally suited for jig-less, small-lot production.

Investigate the advantages of the Moore Jig Borer in your applications. See it in operation at our plant or write for our descriptive literature.

MOORE SPECIAL TOOL COMPANY, INC.
738 Union Avenue, Bridgeport 7, Conn.

MOORE JIG BORER

Bodine LEAD SCREW CONTROL 4-SPINDLE NUT TAPPING MACHINE

The incorporation of several Bodine time-tested principles of multi-spindle design in this NO. 48 Nut Tapping Machine permits high speed tapping of Class 3, 4 and 5 gage threads . . . on continuous schedules with the use of unskilled labor.

Fully automatic

The NO. 48 is completely automatic, a self-contained unit for tapping any nut blank that can be hopper fed up to 1/2" – 13 T.P.I., in mild steel or its equivalent.

Two motor-driven, oscillating hoppers deliver blanks through their interchangeable mouthpieces and two adjustable chutes (each) to working plates . . . where the face of the nut is square with the tapping spindle.

Lead screw PRECISION CONTROL

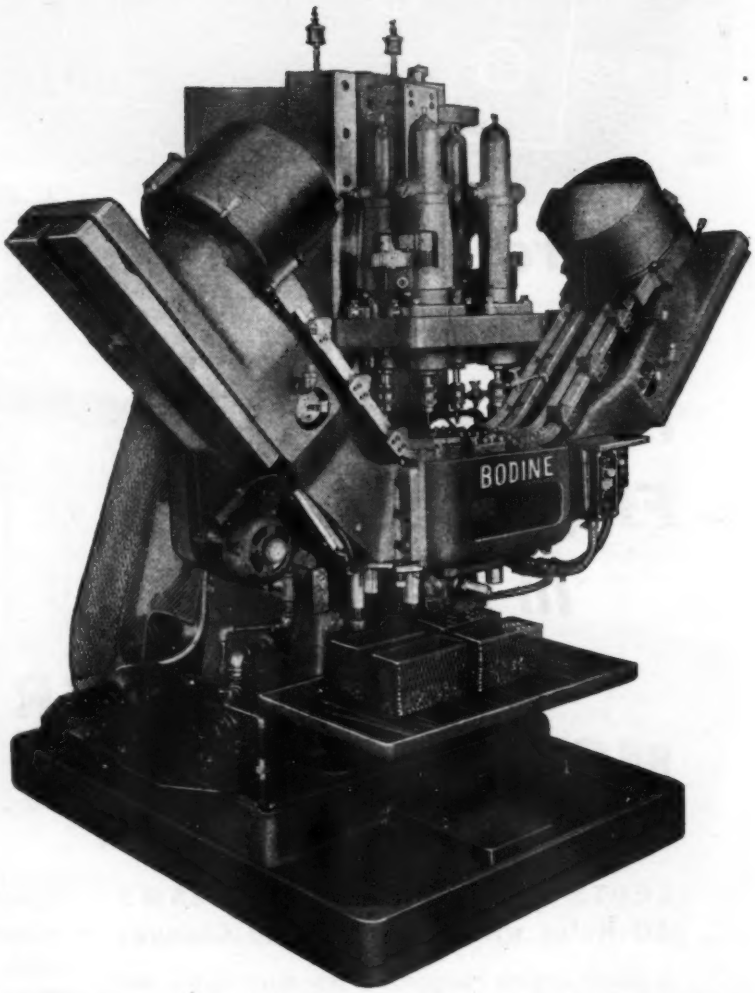
All four spindles are controlled by individual lead screws and operated simultaneously by one segmental gear drive which starts taps at slow speed, then reverses at double the tapping speed. The threads on the master screw and its spring-tensioned nut match those of the tap. Screw and nuts are changed when tap pitch is changed.

Two sizes of nuts simultaneously

If desired, each hopper can carry a different size nut . . . each delivering 2 nuts at each stroke of the spindles. Separate collecting baskets permit frequent gauging of the product of each spindle.

Safety interlocks

No motor can be started except in proper production order . . . nor can the taps operate until blank is in correct position. These electrical interlocks assure safety, protect operator. A varispeed unit permits instant speed changes by the turn of a handle.



No. 48 . . . FOR CLASS 3, 4 and 5 GAGE THREADS

With the use of the lead screws and their engaging threaded bronze nuts, tapping is to classes 3, 4 and 5 gage fit threads.

If "commercial threads" are to be tapped (Classes 1 and 2) lead control spindles are *not* required. Bodine will convert spindles to a spring-compensated type.

MAXIMUM PRODUCTION 9000 PER HOUR

Production speed is dependent upon tap size, threads per inch, nut thickness, material and cutting speed allowable, coolant used, etc. Maximum speed recommended is 45 strokes per minute . . . which totals 9000 nuts per hour.

DETAILED BULLETIN ON REQUEST

THE Bodine CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

DALZEN THREAD GRINDER, No. 5, WITH GUARDS REMOVED

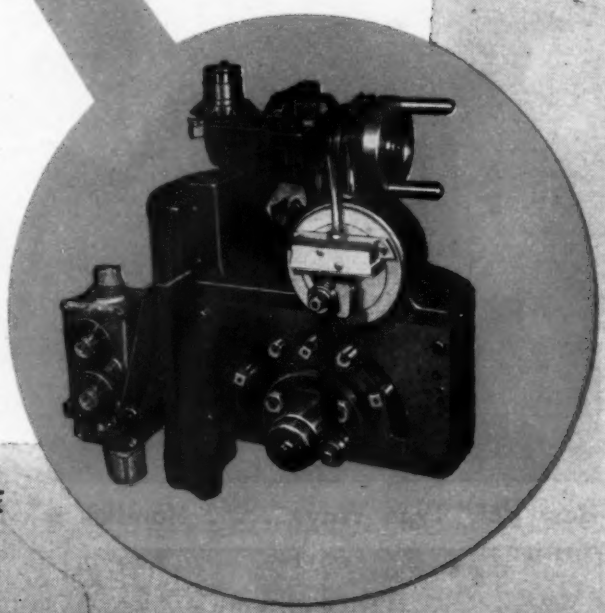
IN THREAD GRINDING . . . THE *DRESSER'S* THE THING!

AUTOMATIC DRESSING IS PROVIDED IN THIS *New* DALZEN *Electronic* THREAD GRINDER

● Accuracy of a ground thread depends upon the accuracy of the dressed wheel. Precision, finish and production efficiency in thread grinding are determined primarily by the dresser.

DALZEN engineers always have recognized this fact. Now . . . the new DALZEN Electronic Thread Grinder presents the latest and best in dresser efficiency—offering new and special advantages in dressing performance.

The new DALZEN Thread Grinder with General Electric Thy-mo-trol drive provides maximum production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. It's an investment in *better* thread grinding, and a *low-cost* investment at that!



An attractive three-color folder describing the new DALZEN Models 5 and 6 will be sent you, free of charge, on request.

DALZEN

TOOL & MANUFACTURING COMPANY

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7" SHAPER

"A Precision Machine of a Thousand Uses"

May be purchased on M.R.O. priority.

A wide variety of jobs can be done accurately, quickly, easily and economically on the AMMCO 7" Shaper.

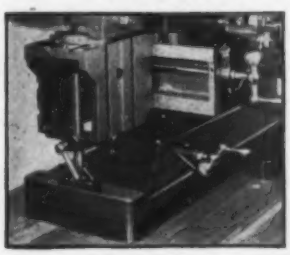
This precision machine has proved itself an essential machine tool for handling exacting jobs in industrial plants, the army, the navy, the marine corps, in mobile machine shops, government agencies, laboratories, tool makers shops, technical schools, etc.

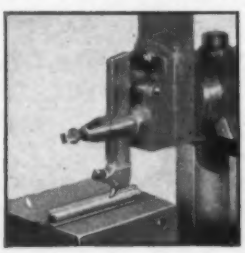
Construction incorporates many features you would expect to find only in larger, more expensive machines... For example: WAYS of ram, tool head, and front face of the main frame are of the "VEE" type, hand scraped to insure accuracy and long life.

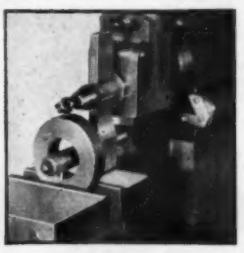
Available for stationary installation or as portable unit ...Portable model is mounted on sturdy maple cabinet, and can be rolled from job to job ...Just plug in to an electrical outlet, and go to work. Saves steps and time.

★

Has "VEE" Type Ways . . . Handles a wide variety of work . . . Accurate . . . Portable







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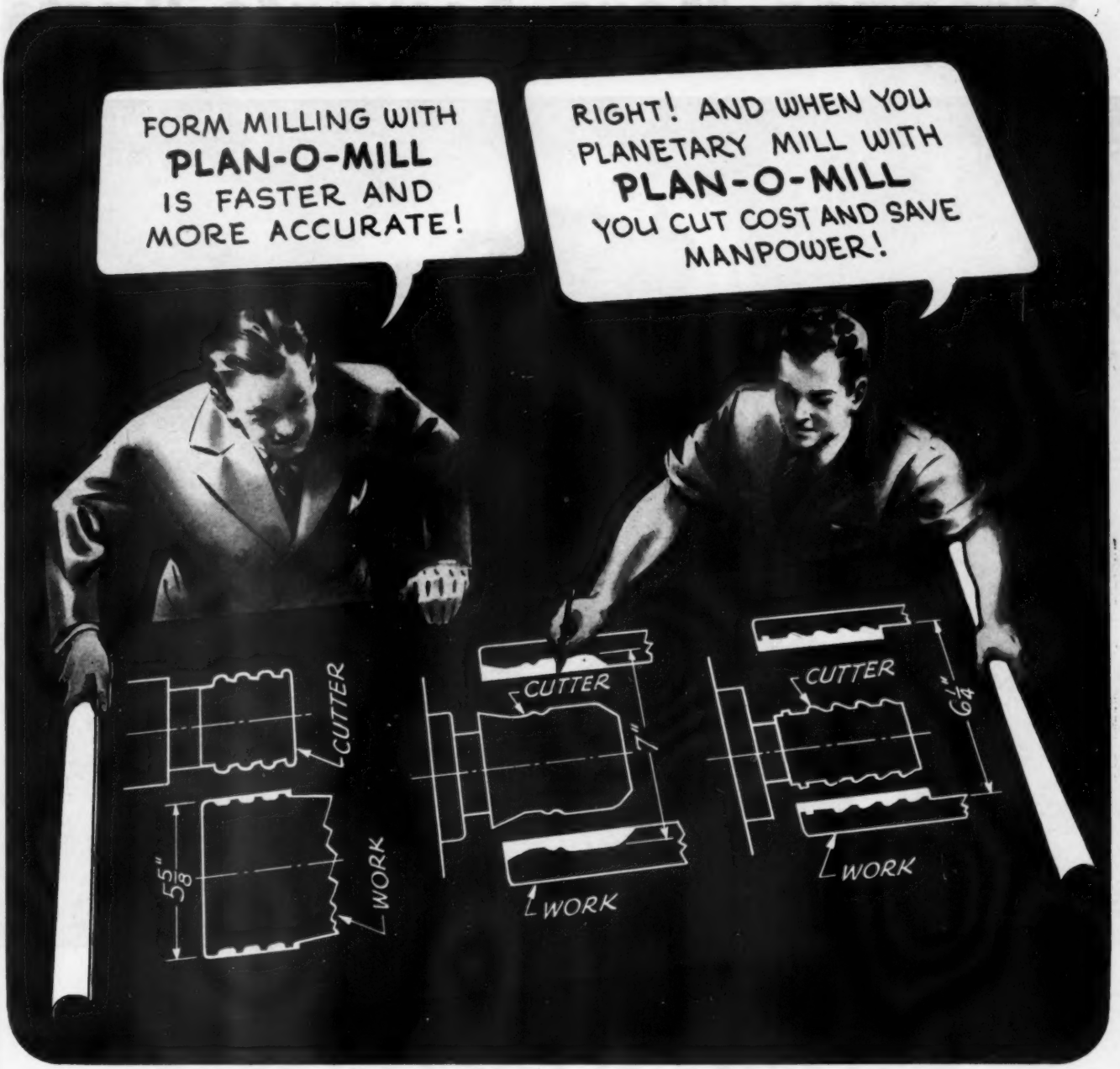


PLAN-O-MILL
"FIRSTS"
1st to install General Electric's remarkable new Thy-mo-trol — electronic feed control!
1st planetary to mill external threads with standard multiple thread cutter!
1st planetary to coordinate feeds and speeds!
1st to provide absolute control of feed-in!

FORM milling of cylindrical parts is just one of the jobs Plan-O-Mill performs with outstanding success.

TIME is saved because of Plan-O-Mill's many rapid production features—including General Electric Thy-mo-trol for separate and complete control of feed-in and feed-around.

METAL is saved because of Plan-O-Mill's remarkable accuracy, even on large and cumbersome work. *The part does not revolve!*

MANPOWER is saved because Plan-O-Mill requires a minimum of skill to operate — a minimum of operator attention.

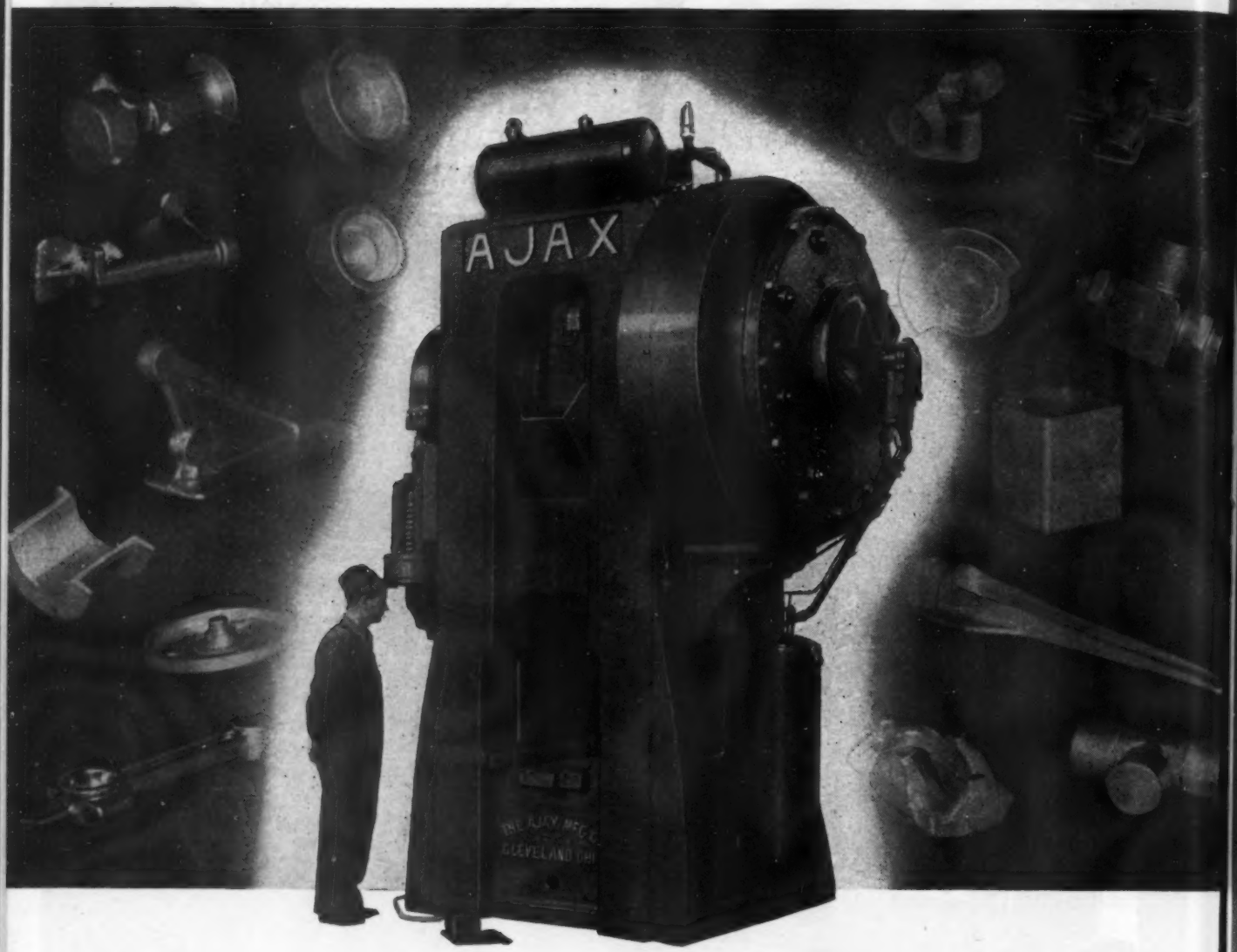
If you, too, are convinced that obsolete machines are wasteful — if you want a *better* method of form and thread milling — find out about Plan-O-Mill today! Contact your machine tool dealer or write Dept. A.

PLAN-O-MILL CORP.

1511 EAST EIGHT MILE ROAD

HAZEL PARK • MICHIGAN

Stronger, More Accurate Parts



Produced at Low Cost on...

AJAX *High Speed* Forging Presses

Forgings of aluminum, brass, magnesium and steel for aircraft parts, shell parts, valves and many types of hydraulic fittings can be produced at high production speeds on AJAX Forging Presses. Production by this forging process shapes the grain flow so that the finished forging has a denser, stronger structure for maximum reliability.

The air clutch on the main shaft provides instantaneous application of tremendous pressure in response to the treadle. This not only makes possible higher operating speeds but results in better filled die impressions without excessive flash. Even small parts of intricate design can be forged to close tolerances, economically on AJAX FORGING PRESSES.

Write for Bulletin No. 75

THE AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND, OHIO
621 MARQUETTE BUILDING • CHICAGO, ILLINOIS

BAKER BROS., INC. SINGLE AND MULTIPLE SPINDLE MACHINES FOR DRILLING, BORING AND TAPPING TOLEDO 10, OHIO

BAKER

No. 3½ x 24 Two-Way Hydraulic Feed Unit Type Machine

Power . . . . . Flexibility!

Here BAKER has produced a machine of a type to meet today's needs for extra heavy duty operations in alloy steel . . . an operation requiring extreme rigidity and power. While the unit shown was supplied for operations in breech rings, it is easily adapted to many other applications. It can be furnished as a 1, 2 or 3 way machine, and the use of standard units, together with proper heads, gives extreme flexibility for horizontal drilling, boring, counterboring, facing, forming and hollow milling.

The hydraulic feed, a unique design, features a movable saddle-carrying head mounted on four nitralloy bars. This arrangement insures longer life plus continuous accuracy of head alignment.

The BAKER line includes drilling, boring and tapping units to meet every requirement.

BAKER BROS., INC. SINGLE AND MULTIPLE SPINDLE MACHINES FOR DRILLING, BORING AND TAPPING **TOLEDO 10, OHIO**

Avey Automatic
METHOD No. 1

THE *Avey* CAM FEED UNIT

No. 1 Size—½" capacity in cast iron.
No. 2 Size—⅞" capacity in cast iron.

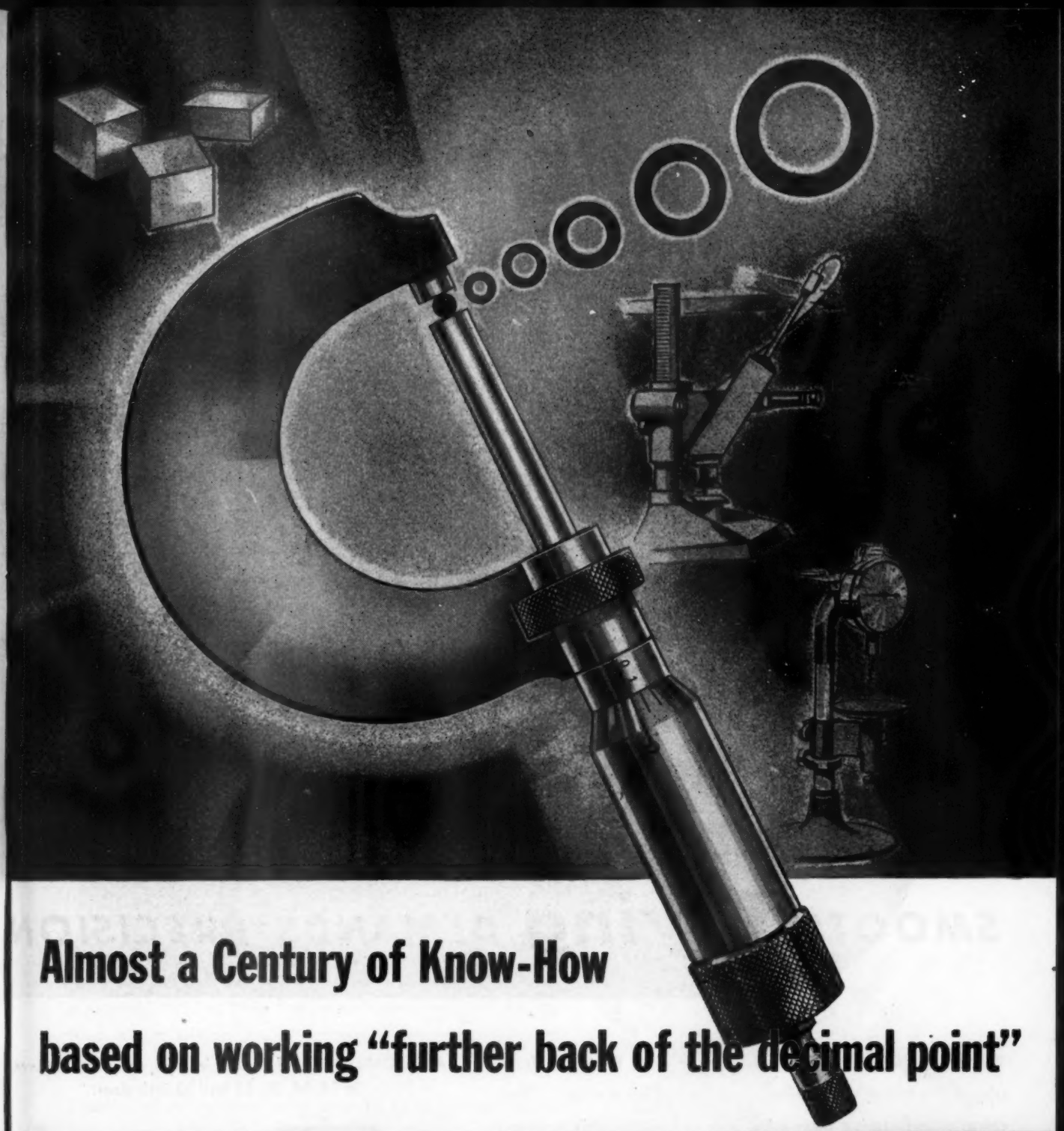
designed for simple automatic indexing when duplication of operation on any number of faces of work is required

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.

The AVEY Cam Feed Unit (Avey Automatic Method No. 1)—a low capital investment. It decreases the cost per piece in production. This is accomplished by Speeding Production—Less Operator Fatigue—the enabling of semi-skilled operators to deliver High Quality Production: Speedily, Accurately, Efficiently, and with a minimum of supervision.

ARMY E NAVY

DRILLING MACHINES



Almost a Century of Know-How

based on working "further back of the decimal point"

Planing 10-inch armor plate to + or −.002 or turning locomotive driving wheels to within .005 of roundness *on a production basis* calls for tools which combine extreme accuracy with advanced design and specialized engineering experience.

Sellers — since 1848 — has maintained its lead by constant improvement in design, and by taking advantage of the latest in measuring and calibrating instruments.

If you have a reputation for accurate work delivered on schedule, Sellers Machine Tools will help you maintain it... Glad to send you complete data on

HORIZONTAL BORING, DRILLING AND MILLING MACHINES

PLANERS—DOUBLE HOUSING AND OPEN SIDE

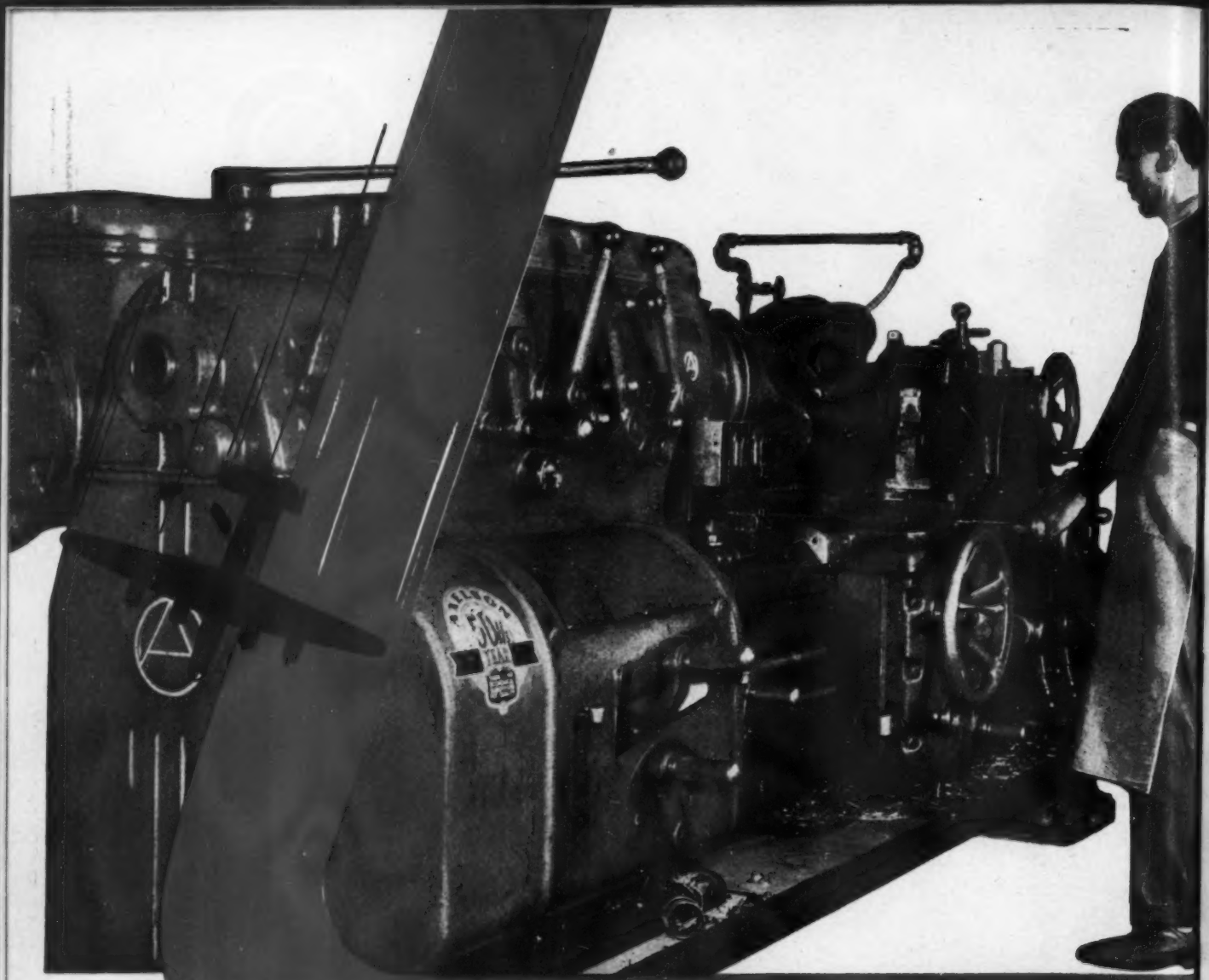
CAR AND DRIVING WHEEL LATHES

AUTOMATIC DRILL AND TOOL GRINDERS

WM. SELLERS & COMPANY, 1610 Hamilton Street, Philadelphia

SELLERS

Precision Tools Since 1848



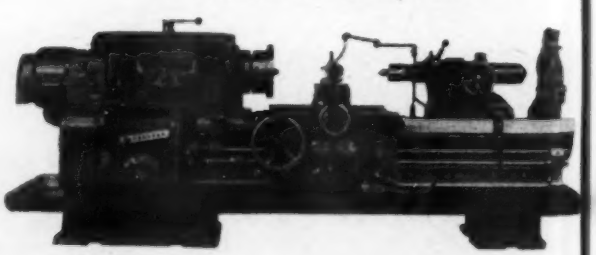
SMOOTH Flying DEMANDS PRECISION

When the pilot of an American airplane gives the signal for a takeoff he's full of well justified confidence in his machine... Precision manufacturing plays a big part in building this dauntless spirit.... Leading aircraft engine builders are using *Axelson Lathes* for the exacting metal turning work built into power plants of sky-liners and sky-fighters. Engines which are remarkable for performance on a "pounds per horsepower" basis: Light, strong, dependable, because they are machined as precisely as a chronometer ... Axelson Manufacturing Company is proud of the part that its thirty years of lathe building now plays in the skyways of war, and will play tomorrow in the round-the-world skyways of peace.

AXELSON MANUFACTURING COMPANY
6160 S. Boyle Ave., (Box 98 Vernon Station) Los Angeles 11, Calif. • 50 Church St., New York City.
3844 Walsh St., St. Louis, Mo.

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

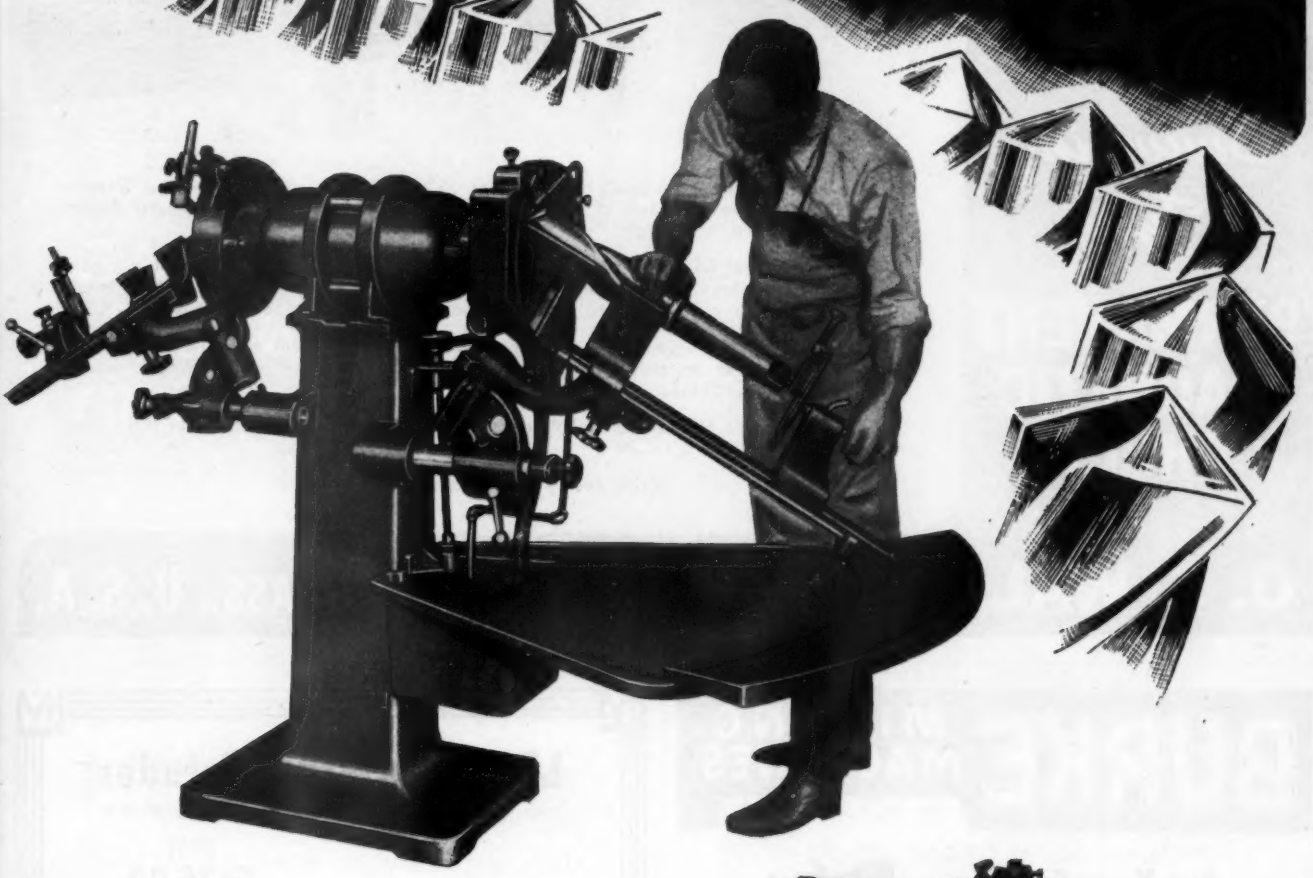
AXELSON LATHES, of various lengths, are manufactured in 14, 16, 20, 25 and 32-inch sizes.



AXELSON LATHES

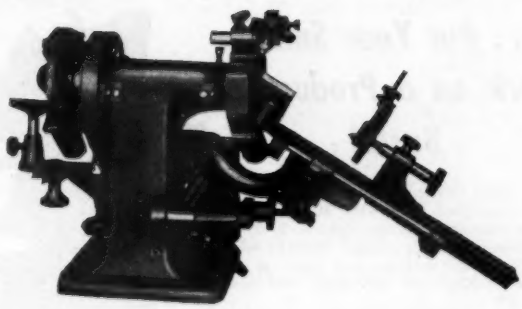
Dependable for over a Quarter Centu

Keep Your Drill Presses DRILLING!



With a Yankee Twist Drill Grinder in your tool room you can eliminate much wasted time and manpower—keep all your drill presses *drilling!* For these famous grinders keep machines supplied with a steady flow of accurately sharpened drills—day after day.

Equally important, Yankees assure the proper, most efficient angle on every drill. That means straight, accurately sized holes every time—reduced reamer costs and less tap breakage. And there are no complicated set-ups. The operator changes from one size drill to another, almost without interruption.



Yankee No. 44 Bench Model—smaller—most popular twist drill grinder of its type on the market.

WRITE TODAY FOR LATEST BULLETIN No. A-134

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

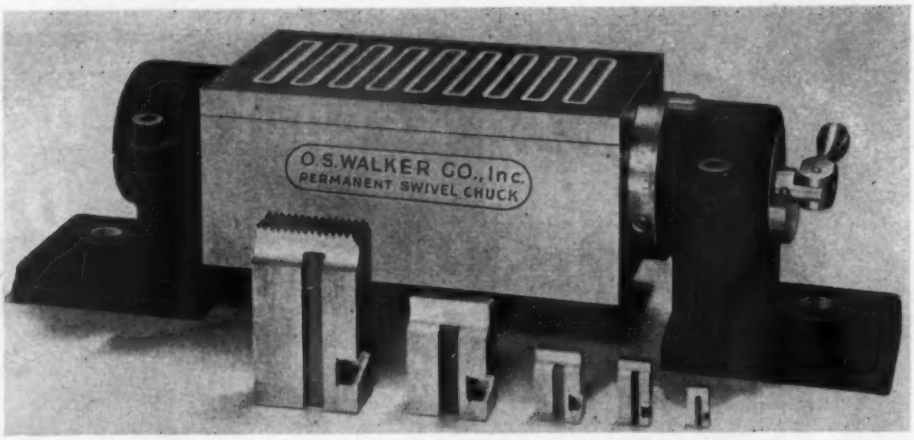
COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

Another New Member of the

WALKER LINE

Swiveling Type

PERMANENT MAGNETIC CHUCK



These new Permanent Magnetic chucks—with 35% more holding power, greater effective magnetic area, are the result of Walker's many years specialization. Their greater holding power is retained indefinitely.

In the new Swivel Chucks, a graduated dial is provided for accurate setting at any point over a swiveling arc of 180°. With only ¾" between pole divisions, the top plate is totally magnetic, thereby contributing to greatly increased holding power assured.

This new development—in response to the demand for a permanent magnetic chuck having all the features of an electro magnetic chuck—supplements the regular Walker line of Walker Magnetic Chucks.

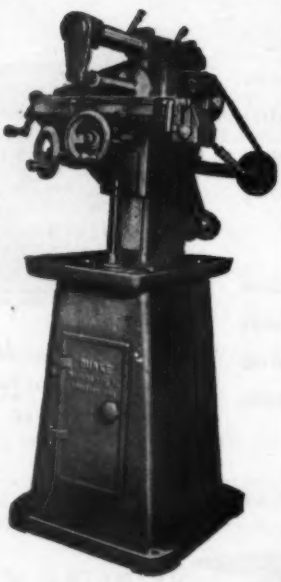
Walker Permanent Magnetic Swivel Chucks are available for early shipment in three sizes: 4" x 8"; 6" x 18"; 8" x 24".

Write today for Descriptive Circular.

O. S. WALKER CO. Inc., WORCESTER, MASS., U. S. A.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!



These small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.

CONNEAUT · · · OHIO

LEACH External Grinder

Price reduction made possible by increased production.

PRICE
$875.00
Fully Equipped

Our dealers will help you fill out necessity priority forms.

Write us today for your nearest dealer's name and address.

Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

Send for Descriptive Literature
EXCELLENT DELIVERIES

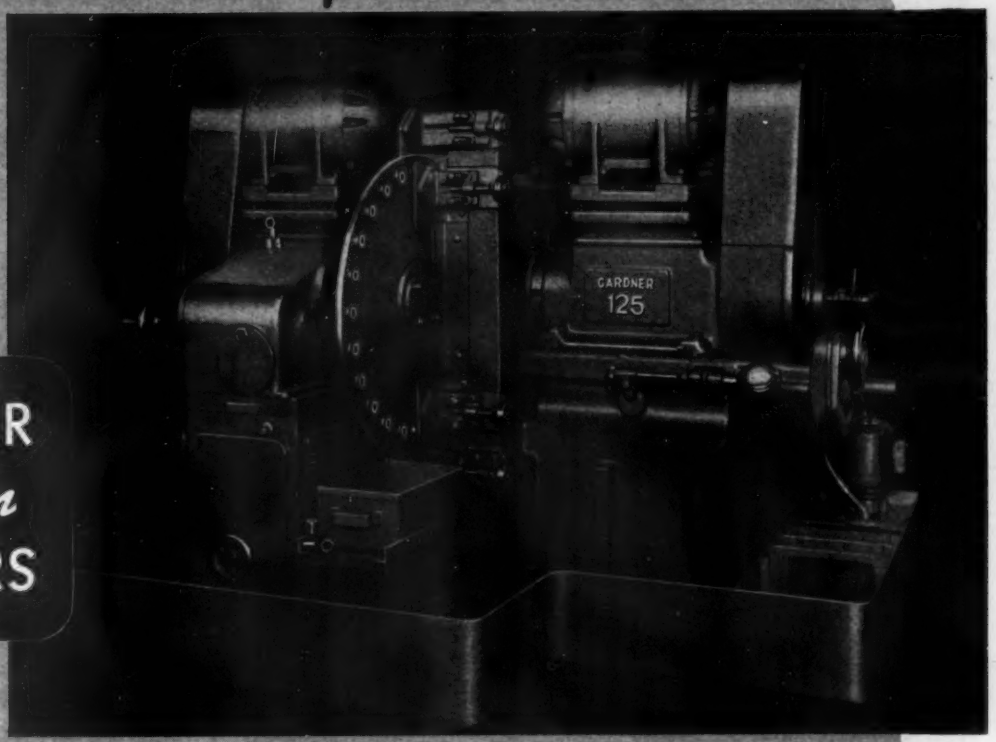
Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES ST. PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World

Get PRODUCTION *plus* ACCURACY



GARDNER *Precision* GRINDERS

with this

GARDNER *Precision* GRINDER

HIGH production—close accuracies—you definitely can get BOTH, on such of your parallel-surface parts as are adapted to Gardner DOUBLE Grinding!

Several models of Gardner PRECISION Grinders, in sizes ranging from 15" up to 30" wheels, are available for dozens of jobs which were formerly ground one side at a time, on the conventional Surface Grinder.

PROOF? Certainly! Ample proof, in the form of many actual installations, one of which is shown here.

This No. 125-23" machine grinds bearing races, 1 7/8" x 1 7/8", AT THE RATE OF 30 TO 40 PIECES PER MINUTE, using a rotary work carrier. Stock removal averages .008" to .010" overall, and tolerances of .0003" to .0005" for squareness and parallelism, and .003" for uniformity, are maintained.

Investigate the possibilities of this method-
Ask for data on GARDNER *Double* GRINDING!

ARMY E NAVY

GARDNER MACHINE COMPANY
410 East Gardner Street . . . . Beloit, Wisconsin, U.S.A.

with

Wickman

SWISS TYPE AUTOMATICS

and their various attachments

In addition to normal turning and forming operations

The No. 2 Wickman machine illustrated is equipped with both three-spindle and slotting attachments. Three other attachments for drilling, threading and taper turning are also supplied for this machine. All Wickman attachments are easily interchangeable.

Do you manufacture parts which are in any way similar to those illustrated above—which require any of the operations listed? Are you interested in holding production runs of those parts to tolerances of ± .0005" or closer and securing finishes as fine as 25 micro-inches? If your answers to these two questions are in the affirmative, Wickman Swiss Type Automatics have a place in your production.

Two Swiss Type Automatics are produced by Wickman. The No. 2 machine shown above has a ½" bar capacity and will handle pieces up to 4" long. The No. 1 machine has 5/32" bar capacity, maximum length capacity of 1 9/16".

LET US SEND YOU FULL INFORMATION

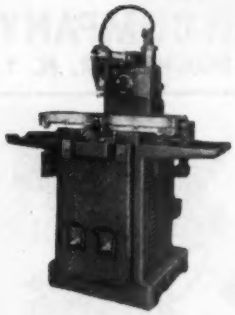
THE Wickman CORPORATION

15539 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

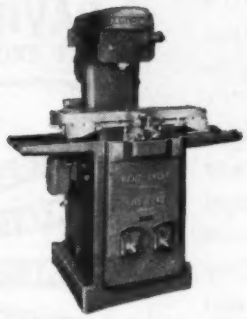
Call on
KENT-OWENS
for Milling Machines

Rugged...
Simple...
Efficient...

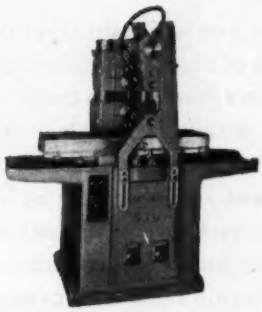
No. 2-20...20" table travel...42" x 12" table...full automatic hydraulic table feed.



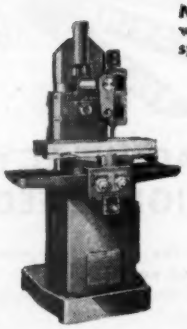
No. 1-14...32" x 9" table.. 14" table travel...hydraulic table feed...full automatic cycle.



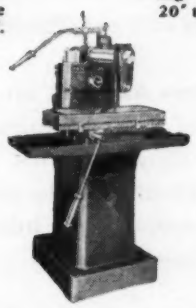
No. 1-14V... 14" table travel with full automatic cycle...spindle speed range 115 to 3000 R. P. M.



No. 2-20DS...Double Spindle Machine for performing two milling operations at same time... 20" table travel...42" x 12" table.



No. 1-V...Hydraulic vertical head feed...5½" head travel...25" x 9" table.



No. 1-M...Hand feed to table and head...25" x 9" table...1 H. P.... head counterbalance is adjustable.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Neff, Kohlbusch & Bissell

DALLAS
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WALKERVILLE
F. F. Barber Mach'y Company

KENT-OWENS MACHINE CO., TOLEDO, OHIO

FILE THIS
PLEASE MISS MITCHELL—

...It's a folder from the Campbell people about their COMPLETE RANGE of Abrasive Cutting Machines...

● Yes, you will want this folder in your file. It's a sort of digest of the complete line of CAMPBELL ABRASIVE CUTTING MACHINES, with references to more detailed catalogs covering each type.

Let this folder serve as a reminder that CAMPBELL engineers are at your service—ready and able to work up cost sheets and practical production procedure for you, based on actual production records of CAMPBELL Machines. They ask you to state (1) materials, (2) shapes and sizes you are cutting, (3) lengths before cutting, (4) lengths of cut-off pieces and (5) required production per hour.

CAMPBELL ABRASIVE CUTTING MACHINES are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramics—solid bars, tubular and flat stocks.

Write for the above folder—or for information on your specific cutting problem.

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

WITH ACCURACY AND HIGH SPEED

You will find the Linley most adaptable to the many small but vitally important jobs that must be rushed through a busy tool room.

It has been designed to save your machines of larger capacity . . . to speed setups . . . to permit a choice of 8 speeds (to 4250 r.p.m.) and to prevent pencil figuring errors with the direct micrometer setting.

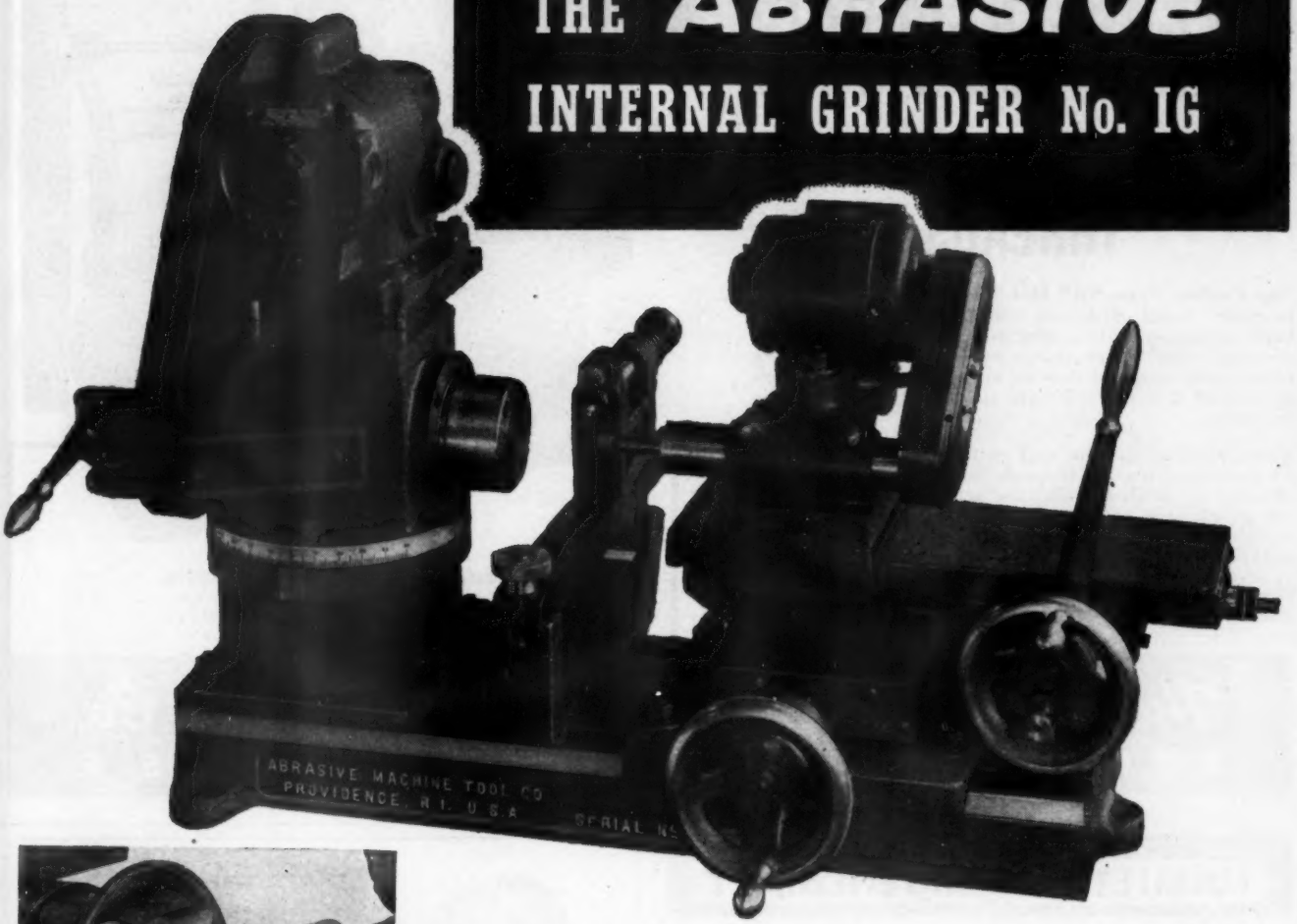
The compactness, rigidity, accuracy and speed make the Linley the handiest tool in the shop . . . a real money maker.

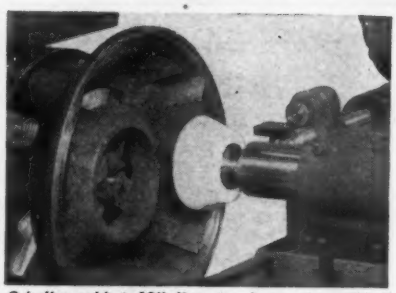
Table Size 7" x 17½"
Floor Space 18½" x 20"

Write for detailed Bulletin

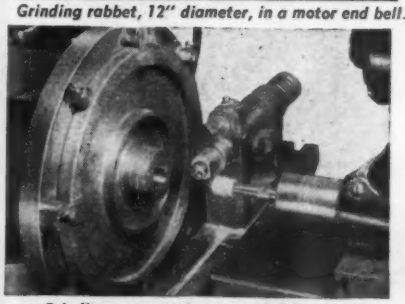
LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

THE ABRASIVE INTERNAL GRINDER No. IG





Grinding rabbet, 12" diameter, in a motor end bell.



Grinding accurately tapered hole in 10" diameter flywheel.

Grinding concave form hardened steel die.

ABRASIVE No. IG Internal Grinder offers unusual versatility and range for both toolroom and high production work. With longitudinal rack travel of 8" and screw cross feed of 3¼", a wide variety of grinding jobs can be accommodated. Diamond wheel dresser assures accuracy of holes up to 12" diameter. Work head swivels through 360°. Both cross slide platen and wheel head platen are adjustable longitudinally and transversely. Work spindle mounted on super-precision ball bearings, sealed against abrasive grit, assures long-lived accuracy.

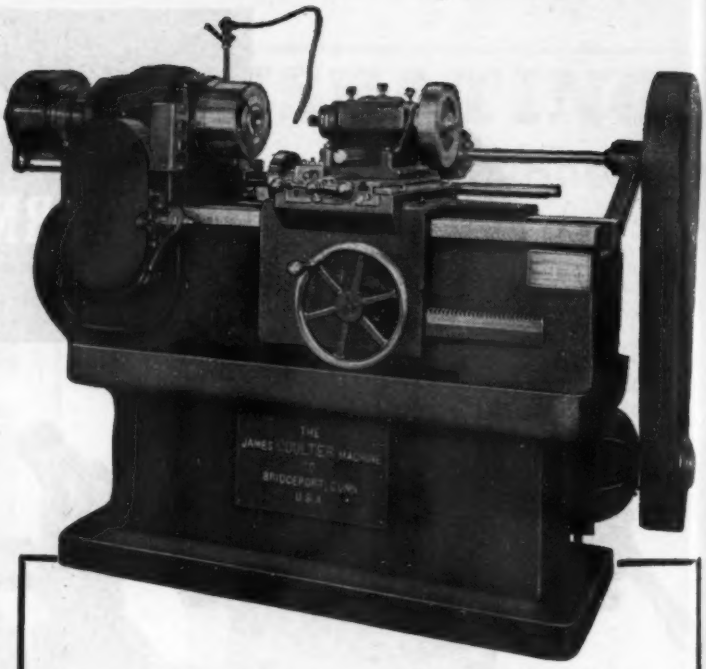
Available for Prompt Delivery. Write for illustrated bulletin.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL COMPANY, EAST PROVIDENCE 14, R. I. ***Dealers in Principal Cities.***

Keep Ahead of DEFENSE DEMANDS on the PRODUCTION of EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

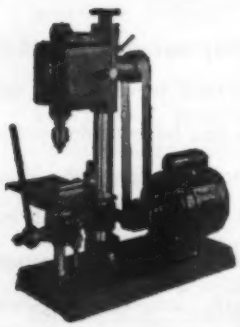
Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT · CONNECTICUT · U.S.A.

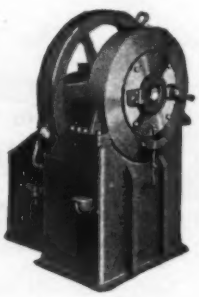
HAMILTON-MUEHLMATT



. . . for Speeds Sensitive Tapping

A high production sturdy little machine particularly suited to precision tapping of light work such as instruments, cameras, watches, clocks and business machines. Sensitivity of operation, and high spindle speeds account for accurate work without breakage of fine taps. Can be attached to any light socket. Write for complete information.

The Hamilton Tool Co.
HAMILTON OHIO

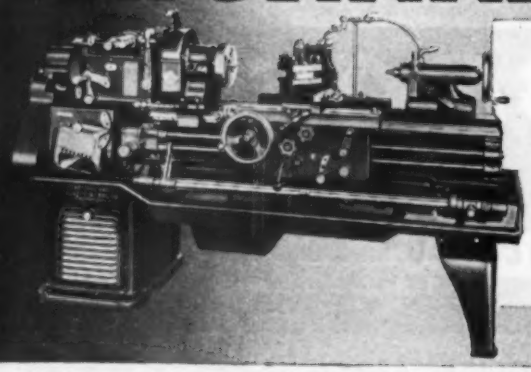


THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street **Torrington, Conn.**

CINCINNATI LATHES



Assure High Production to Exacting Standards

Ruggedness, accuracy, versatility and speed are combined in Cincinnati Lathes in exactly the right proportion to meet the rigid demands of war production. If you will outline the aircraft, munitions or other similar jobs which require improvement in handling, our engineers will gladly offer suggestions for tooling which will assure the utmost in accuracy and output. Send for catalog giving details of Cincinnati Lathes—in sizes from 14" to 30".

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

OW TO APPLY THE TIME-SAVING ADVANTAGES OF

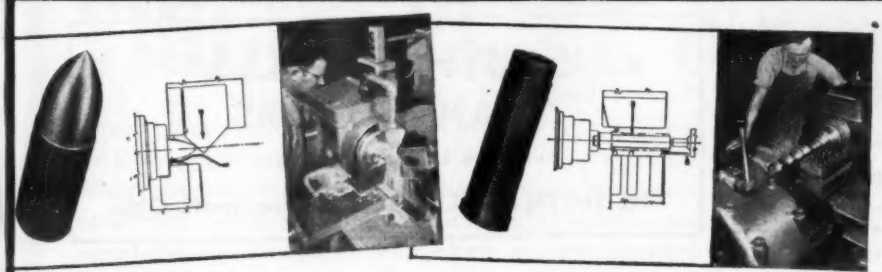
Multiple Tooling and Automatic Cycling to *BOTH* Long and Short-Run Turning . . .

PLICITY OF SET-UP
Setting Control Dogs
Time 8 Minutes
Adjusting Rear Slide to Front Dwell Position
Time 8 Minutes
Running Through Complete Cycle by Hand Crank
Time 2 Minutes
Positioning Front Tools Around Master Sample
Time 8.5 Minutes
Positioning Rear Tool Blocks
Time 6 Minutes
Setting Tool Relief Blocks
Time 3 Minutes
Time 1.5 Minutes
Time 4.4 Minutes
Final Adjustment of Tools
Time 3 Minutes
Setting Feed-in and Dwell
Time 4 Minutes
Selecting Correct Feeds and Speeds
Facing Master Sample in Machine
Total Time . . . 30 Minutes

ONE REASON WHY IT IS POSSIBLE TO INCLUDE SHORT-RUN WORK ON THIS AUTOMATIC LATHE

Here are two typical pages from this new book. The simplicity of set-up of the Sundstrand Automatic Lathe is only one of *seven reasons* why this lathe can handle both long and short-run turning work more profitably. Jobs of both types, as well as special turning jobs, are described complete with tooling diagrams and illustrations.

Whether you have a mass production, short-run or a combination of both types of turning jobs, the Sundstrand Automatic Lathe can be tooled up to handle either one faster. This is due to the seven machine design factors which have been incorporated in this outstanding lathe.



A Long-Run Turning Job

Starting from bar stock, cut to length, the Sundstrand Automatic Lathe contour turns and forms the nose of 75 mm. shot. Oftentimes one operator can run one or more machines, depending upon the cycle time.

A Short-Run Turning Job

On a lot of 40 sleeves the turning time was reduced from 75 to 8 minutes. Other parts turned include sprockets, pulleys, gears, etc., with lot sizes of 25 to 100 pieces.

The simplicity of cycle change-over and set-up, for instance, permits setting up some jobs in less than 30 minutes . . . making it profitable to tool up for short-run turning. Obviously, these savings are also available and desirable for long runs.

Get the complete information on this lathe today. The free booklet offered contains a lot of valuable turning information that may prove profitable on *your* turning work.

GET THIS *FREE* BOOK TODAY ➡ ➡ ➡

You'll find many lathe jobs similar to yours in this book. You'll also find valuable production data to compare with the performance of your present equipment. Write for your copy today. Ask for book 125.

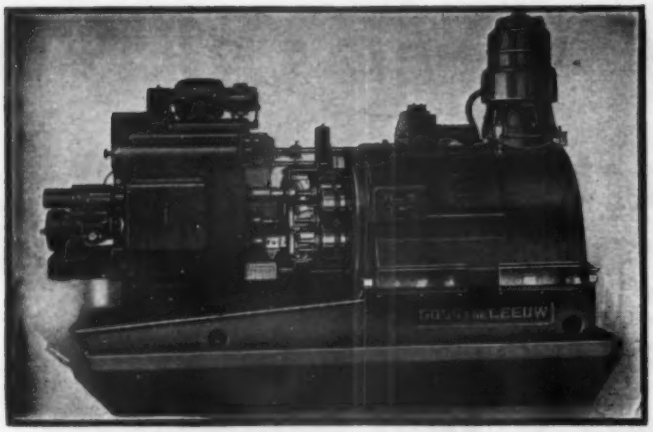
SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

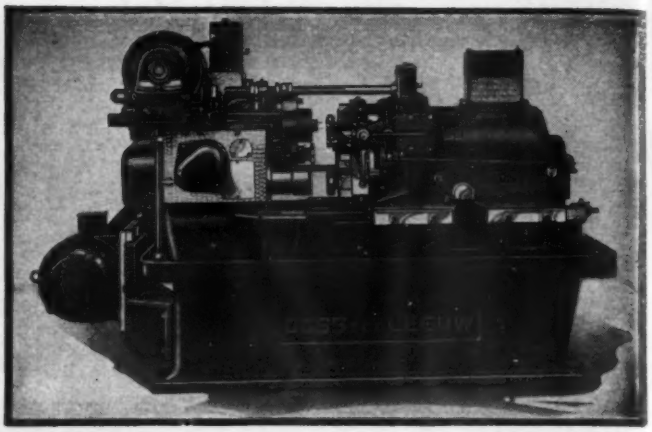
ARMY NAVY

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

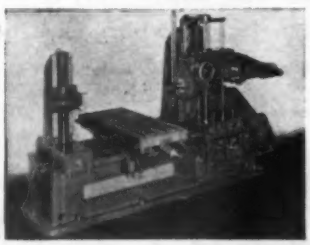
Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

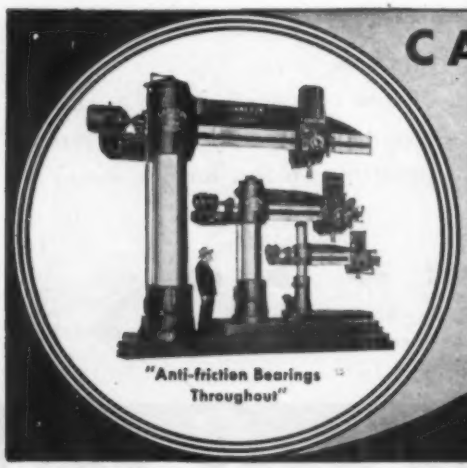
UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio



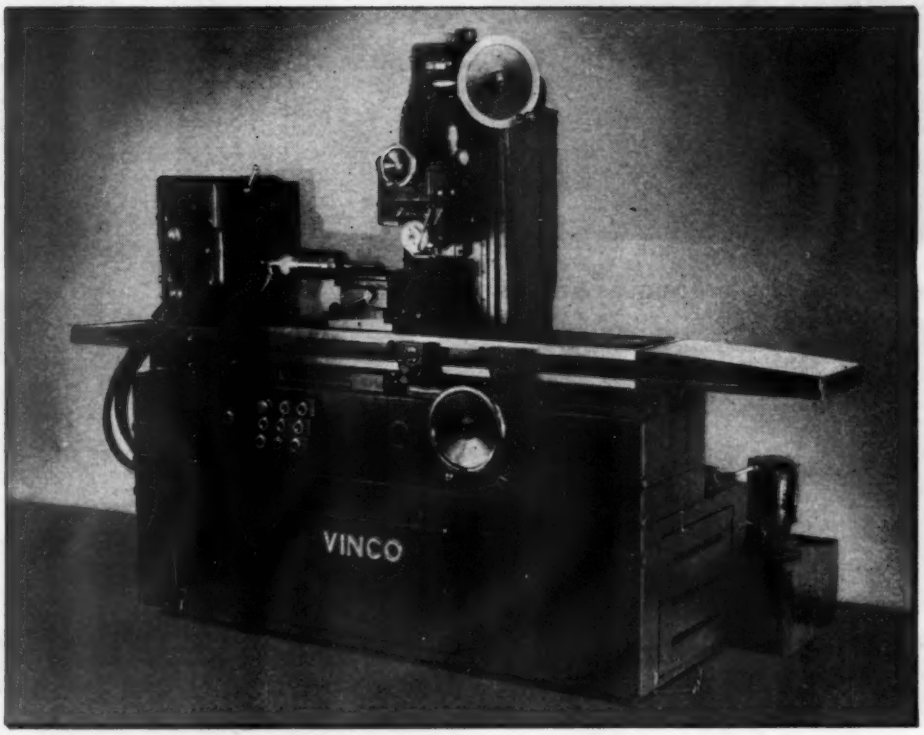
"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

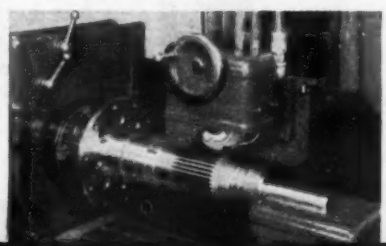
The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY



VINCO SPLINE & GEAR GRINDER

Here is a grinder that can safely be termed "super". Semi-automatic, hydraulically controlled, it does a fast, accurate job of grinding splines and gears in production. Wheel dressing and wheel feeding are the only non-automatic operations, and the only adjustment necessary is to compensate for wear of the dresser diamond. Its high degree of accuracy is due to a number of exclusive features—chief of which are the index head and plate, the index spindle, the wheel spindle and the Hydraulic Controls. The work, when indexed, instead of coming to an abrupt stop, is slowed by hydraulic action in the index head and the pawl drops gently into the slot of the master index plate. The plate is made with gage accuracy, being guaranteed accurate to within .0003" accumulated error. The index spindle is mounted in special ball bearings and so closely fitted that there is no radial play or end play. The wheel spindle is driven by belts from a motor mounted in the column. Hydraulic "Feed and Deceleration" valves control the table which is slowed to a stop at each end of the stroke, thus preventing any jar. Similarly, its return is gradually accelerated for the first 1½" of stroke. Through our pressure regulator, practically constant pressure is maintained and uniform rate of feed accomplished. Automatic timing and synchronization of all movements is a tribute to the engineering skill behind this exceptional machine tool. Write for specifications.



VINCO CORPORATION
8851 SCHAEFER HIGHWAY
DETROIT 27, MICHIGAN

MILLIONTHS OF AN INCH FOR SALE BY VINCO

DOUGLAS PRECISION MILLER

for Toolroom and Production

Size 32" x 8" Plain

THE PRECISION BUILT INTO THE DOUGLAS MILLER

provides efficiency and speed to produce small parts requiring the extreme accuracy essential for war production.

Rigid well balanced design, combined with central control make for easy operation, permits the release of highly skilled labor for other tasks.

A wide selection of speeds meets all requirements for toolroom and production.

There is an ample variety of feeds from which to choose the right feed for material and accuracy requirements.

Timken bearings and helical drive gears are other features to assure a smooth performance. Write today for specifications and prices.

PROMPT DELIVERY

DOUGLAS MACHINERY CO., Inc.
155 BROADWAY • NEW YORK, N. Y.

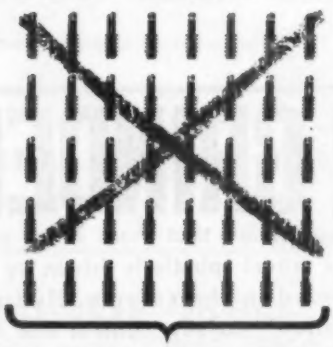
PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

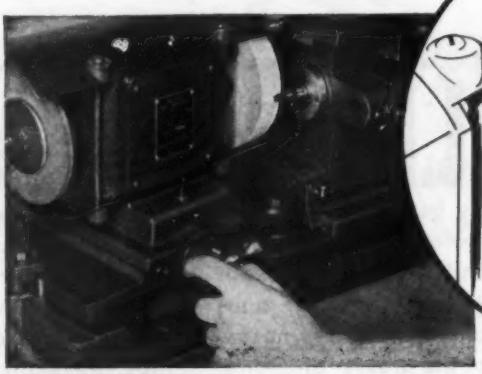
• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

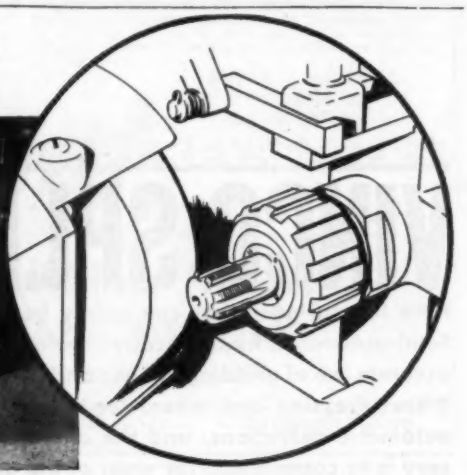
THE PORTAGE MACHINE CO.
AKRON 11 OHIO

WHY BUY *FORTY* TAPS IF



***EIGHT* WILL DO?**





EDWARD BLAKE CO.

634 COMMONWEALTH AVENUE
NEWTON CENTRE 59, MASS.

Please send me Bulletin 5A, which gives complete details on the Blake Tap Grinder.

Name..... Title.....

Company .....

Street .....

City..... State.....

A.M.

SHARPEN THEM ON THE BLAKE TAP GRINDER

. . . And that's conservative, because Blake Tap Grinder users report "tap life increased ten times" . . . "salvaged $30,000 worth of taps in one year, on one machine" . . . " haven't bought a new tap since we bought the Blake" . . . "Paid for itself in less than 3 months".

You can reduce tap inventory, you can increase tap life, you can increase accuracy and production by sharpening the chamfer on right- or left-hand taps with 2, 3, 4, 5, 6, 8 and 10 flutes on a Blake Tap Grinder. There are two machine sizes which are described fully in Bulletin No. 5A. Send for your copy today.

BLAKE TAP GRINDERS—L & D HIGH SPEED DRILL PRESSES—WALTHAM CUTTER SHARPENERS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS

BUY UNITED STATES WAR BONDS AND STAMPS

MORE PRODUCTION PER MAN HOUR
These smaller size Niagara Inclinable Presses offer the same design features of larger Niagara Models. The instant acting 14-point sleeve clutch is an important factor in increasing the output per man hour. It is possible that one or more of these presses can help you in speeding up production of urgently needed wartime material.
A1¼
A1½
A1¾
A2
A2¼
A2½
NIAGARA
NIAGARA MACHINE & TOOL WORKS
BUFFALO, N. Y.
DETROIT • CLEVELAND • NEW YORK

● BUY UNITED STATES WAR BONDS AND STAMPS ●

MOREY TURRET LATHES

for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
18½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

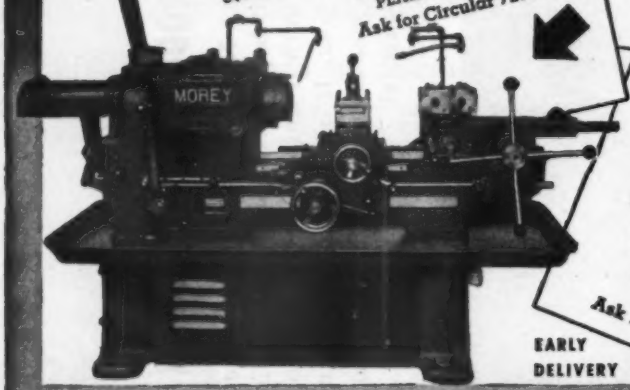
2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY



- DEFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (poteau applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES. SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY-NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

GRAND RAPIDS

No. 15
Motor Driven
Surface Grinder
HAND FEED

•

FOR SMALL DELICATE JOBS

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel

Reasonably Prompt Delivery

Many manufacturers on war work are using large batteries of these grinders.

CATALOG ON REQUEST

GALLMEYER & LIVINGSTON CO.
330 Straight Ave. S. W.
GRAND RAPIDS MICHIGAN

Variable Speed
SPEED LATHES *for* PRECISE LAPPING OF GAGES

•

Ideal FOR FINAL FINISHING OPERATIONS

Speeds as low as 20 r.p.m., for accurate lapping of gages, and as high as 4,000 r.p.m., (with ample power for rotating heavy work), for de-burring, polishing, filing, etc., are available in these foot-operated speed lathes. Speeds are infinitely variable. Write for Catalog 440.

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
2067 READING ROAD . . . CINCINNATI 2, OHIO

HERE'S THE

New Model Nichols Miller

Here's the New Model of one of the most versatile precision milling machines on the market.

Besides conventional milling, the Nichols Miller performs dozens of unusual operations—such as profiling, boring, facing, diamond wheel-grinding—*to tolerances in tenths.* Rise-and-fall spindle arrangement and a full line of attachments make the Nichols especially valuable for the toolroom or laboratory.

Worth remembering: Several thousand of these millers are in operation the world over—and we've never required a full-time service man!

WORKING SURFACE: 6¾" x 21", or 6¾" x 30". RANGE: Longitudinal, 10" or 19"; Transverse, 7"; Vertical-Knee, 13½"; Spindle Rise and Fall, 4½". STANDARD SPEEDS: to 2400 RPM. SPECIAL SPEEDS: to 5000 RPM.

Also Available—Nichols Millers for special requirements. Nichols Double-Spindle Millers for high-production needs.

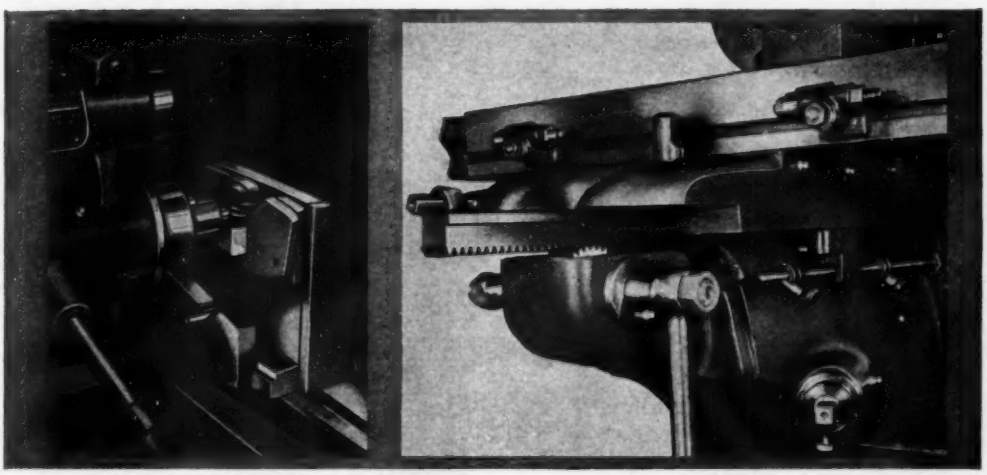
Immediate Deliveries—Send today for descriptive literature and free 86-page Handbook of unusual applications.

EXAMPLES OF NICHOLS VERSATILITY

(Left to right)

PROFILE MILLING, using template and follower, with remarkable ease of control, work-piece under full view.

RACK AND PINION TRANSVERSE FEED, available in place of standard feed screw for rapid motion on drilling, end-milling and boring operations.



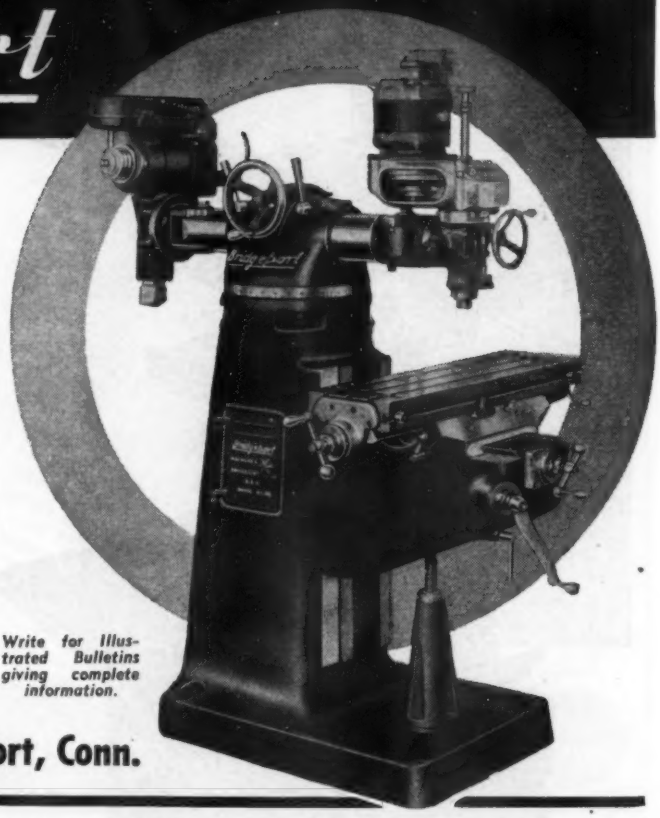
Manufactured by W. H. NICHOLS & SONS, Waltham, Mass.

SOLE DISTRIBUTORS

NICHOLS-MORRIS CORPORATION

50 CHURCH STREET, NEW YORK 7, N. Y.

Announcing a new shaping attachment by Bridgeport



This new sturdy accurate attachment — for which a tremendous demand has existed — is at last in production and available for use on existing Bridgeport Turret Milling Machines now in the hands of users. It can also be mounted on all types of milling machines and on special production equipment.

As applied to "Bridgeport" machines it is mounted on the back end of overarm and can be set for operation at all angles. It provides a fast, convenient and practical means for shaping large and small die and mold work. It is extensively used also on intricate production jobs where slotting operations are necessary.

The Bridgeport Turret Milling Machine — a machine of outstanding versatility and flexibility — features the Bridgeport Milling Attachment which enables it to handle drilling, boring and milling at all angles without changing set-up of work. All modern features of the conventional milling machine are available which with this attachment makes the Bridgeport a universal machine of unparalleled utility.

Bridgeport High Speed Milling Attachments, like the Shaping Attachment, can be mounted on milling machines of all types and on many types of special production equipment.

Write for illustrated Bulletins giving complete information.

THE BRIDGEPORT MACHINES, Inc., Bridgeport, Conn.

Your Tapping Questions

When should I use a two-flute tap?

What is meant by per cent of thread?

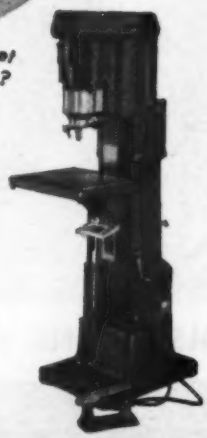
Is the type of cutting oil important?

How much chip clearance should I allow in a blind hole?

Which holding fixture?

How can I get more tap life?

Answered



Precision tapping is a science in itself, and even an experienced operator will occasionally run into a snag. Our engineers are trained in the field. Draw on their experience and knowledge to reach a solution to your problem quickly and easily. Write for catalog. Send your questions to R. G. Haskins Co., 2761 West Flournoy Street, Chicago, Illinois.

HASKINS

haskins

PRECISION TAPPING EQUIPMENT

GREENFIELD No. 4
CUTTER and REAMER GRINDER

Made in Plain and Universal Types for practically all grinding jobs

Send for illustrated literature

With the variety of attachments available, this machine can be used not only for grinding formed cutters, taper reamers, rose reamers but also for surface grinding, grinding compound angles, cylindrical and internal grinding. Additional attachments, also available, provide for twist drill grinding and radius truing.

As a Universal Type (No. 4U), the cylindrical grinding capacity is 4" dia. by 15" long, and internal grinding up to 4" diam. minus wall thickness. Standard equipment with this type includes a 4" Universal Scroll Chuck.

SPECIFICATIONS: Swing over table—8½". Center spindle to table—10". Table Surface—5½" x 28". Will grind on centers—8½".

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

Hy-Draulic

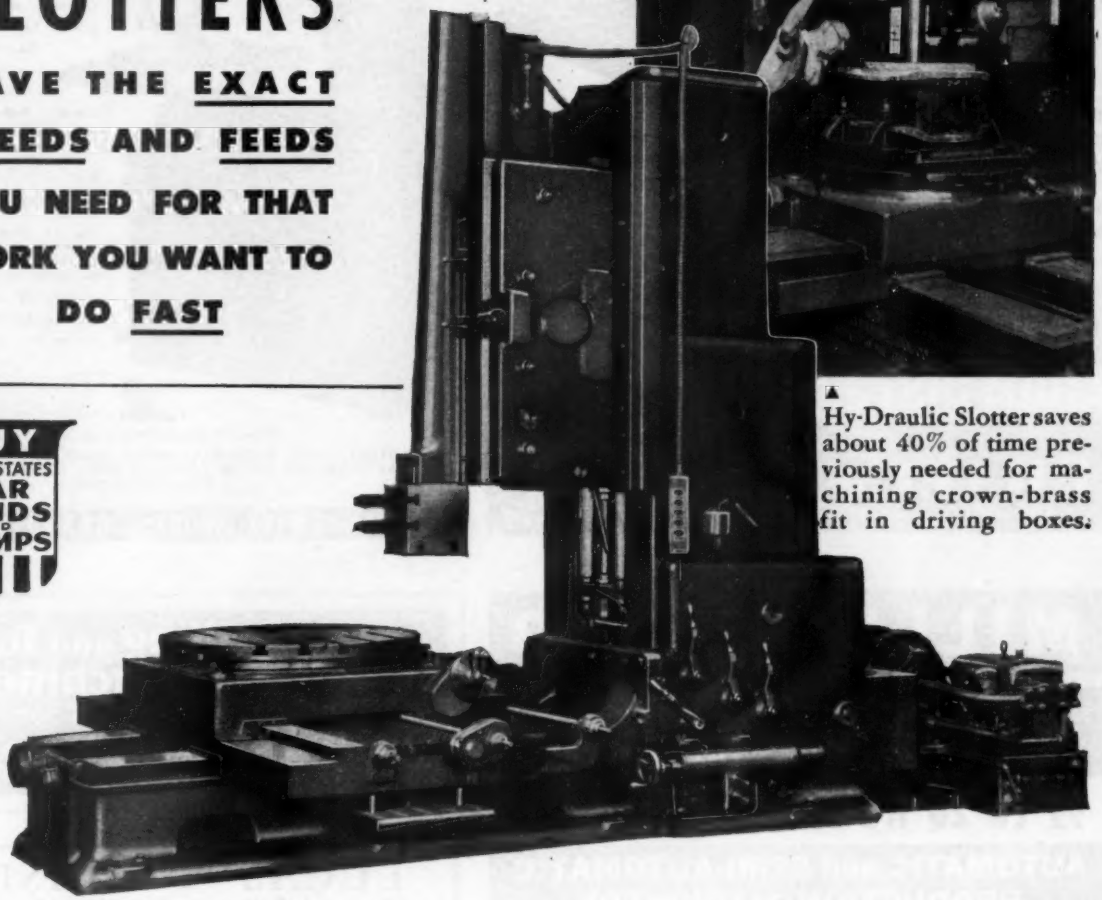
Reg. U. S. Pat. Off.

SLOTTERS

HAVE THE EXACT SPEEDS AND FEEDS YOU NEED FOR THAT WORK YOU WANT TO DO FAST

▲ Hy-Draulic Slotter saves about 40% of time previously needed for machining crown-brass fit in driving boxes.

BUY UNITED STATES WAR BONDS AND STAMPS



Hy-Draulic Slotters do fast work in the manufacture and maintenance of locomotives and other railway equipment, ordnance parts, pumps, compressors, diesel engines and a wide variety of other products. They are accurate, easy to operate, highly efficient. Cutting speeds and feeds are infinitely adjustable throughout specified ranges. The *exact* combination of speed and feed most suitable for each job can be established quickly and easily; can be altered readily if required by changing conditions.

Cutting speed is uniform from beginning to end of chip, reversals smooth and shockless, return ratios higher than mechanical drives. These and other advantages enable operators of Hy-Draulic Slotters to establish and maintain new high production records, without excessive fatigue.

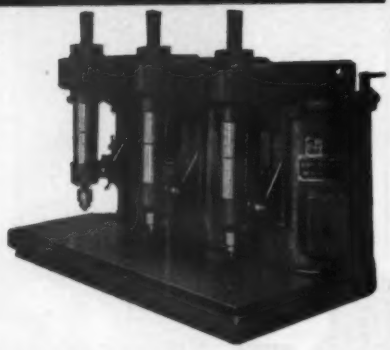
One of the early 36″ stroke Hy-Draulic Slotters is shown at top right, current design in center. Hy-Draulic Slotter, 12″ stroke, also available. Investigate. Write today for Bulletin 1111.

4404

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS

SIGOURNEY M-100

STRENGTH
ACCURACY
RIGIDITY
•
drills down to .008" diam.



Sigourney M-100 Drilling Machines have the built-in strength and rigidity that mean a high degree of maintained accuracy on the most exacting precision drilling. They will drill holes from .008" to ¼" in diam. Available in 1, 2, 3, and 4 spindle models . . . speeds from 4,000 to 10,000 r. p. m. . . . all moving parts completely enclosed for maximum operating safety.

Send for illustrated bulletin.

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

Sole Sales Agents
PRATT & WHITNEY
Division Niles-Bement-Pond Co. West Hartford, Connecticut

INVESTIGATE Tannewitz DI-SAWS

and Youll Want No Other!

Larger wheels (24" diameter on the standard models) provide greater traction, faster, straighter cutting, more production. Transmissions, common source of die saw grief, never fail in TANNEWITZ DI-SAWS. Sturdier, heavier construction throughout, plus many refinements of design, make these machines the greatest trouble-free producers in their field. It pays to buy the best!

With a TANNEWITZ DI-SAW you can do in minutes jobs which require hours by the shaper, miller or lathe methods; and there are models to accommodate work of practically any size. Get the facts. Write for "DI-SAW Bulletin".

STANDARD MODEL No. M24 (24" WHEELS)

Other Bulletins Worth Sending For:
"SINGLE AND VARIABLE SPEED BAND SAWS FOR FOUNDRY USE", "SHEET METAL CUTTING BAND SAWS". Just a line will bring them promptly.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH

MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS-CRANK SHAFTS

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

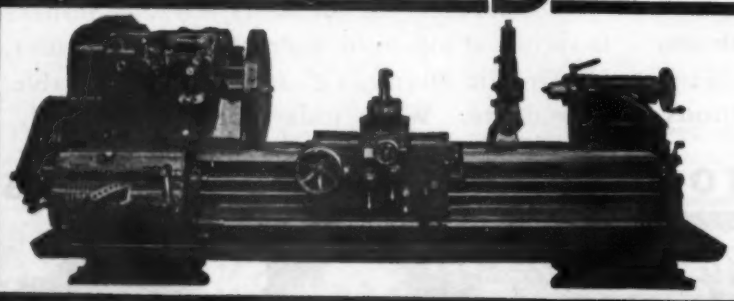
LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

TOOLS TO BUILD THE WORLD OF TOMORROW

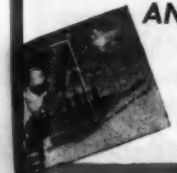
. . . . *born from the need of today*

JOB-PROVEN FEATURES OF Thor "Armored-In-Plastic" ELECTRIC TOOLS

Born of a need to conserve critical aluminum, Thor "Armored-In-Plastic" portable electric drills today are smashing quotas on the jobs for which they were created!

Developed with features that provide light weight, easy handling, toughness and durability . . . these remarkable tools bring to vital industries unsurpassed production performance.

Thor "Armored-In-Plastic" portable electric tools already have a solid background of experience that will enable them to fashion—*more rapidly and more lastingly*—the emerging "World of Tomorrow."

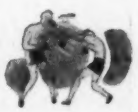


AND...WHAT ABOUT "THE TOOLS OF TOMORROW?"

Thor has more new and revolutionary portable electric tools in its experimental laboratories today than at any time in its fifty years of pacing the field with new developments. For a brief glimpse of the trend, ask for your copy of Thor's remarkable new booklet, "Tools to Build the World of Tomorrow...Born from the Need of Today."

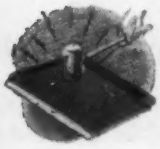
Extreme lightness of weight—Application of "Thorite" plastic in gear case, field case and handle housings provides 14% lighter weight—without sacrifice of maximum power and other essential properties.

Exceptionally high impact strength—Tests by approved laboratory methods show "Thorite" plastic tool housings to have impact strength greater than aluminum... assuring high resistance to shock blows.



Remarkably low thermal conductivity—"Thorite" is a non-conductive plastic that prevents heat developed by the motor from being transmitted to the hand of the operator . . . providing *constant* cool handling.

Increased safety factors—"Thorite" plastic housings, so efficient as non-conductors, offer *extra* safety against electrical shock.



Toughness and durability—Strength characteristics of "Thorite" plastic, as shown under approved testing methods, compare favorably with aluminum.

(Tensile strength — 8,000 pounds per square inch; Flexural strength — 13,000 pounds per square inch; Compressive strength — 23,000 pounds per square inch.

Thor Portable Electric Tools

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO, ILL.

Branches in Principal Cities

NOW—you can have "MX" cushion

Removing run-out fin and polishing threads on worm gear.

IN 1942 "MX" Wheels, a development by Carborundum Engineers, were introduced for the removal of disturbed metal. Two years of use by industry in manufacturing a variety of metal parts has demonstrated their unusual qualities.

Cushion Action: Fast and effective with elimination of vibration and chatter.

Self Cleaning in addition to clean cutting: An "MX" wheel rarely loads up even when working on the softer metals or alloys.

Versatile: The wide range of operations on which "MX" is being used proves its adaptability to broad industrial application.

Safe Operation: The unique combination of abrasive grain, fibre and bonding material gives "MX" its high tensile strength.

Long Life and Re-Use: "MX" Wheels may be combined in groups and re-dressed for re-use on other than their original operations.

IN 1944 Now, "MX" Mounted Wheels and Sticks are also available to industry. These new tools make possible a broader industrial application of the product.

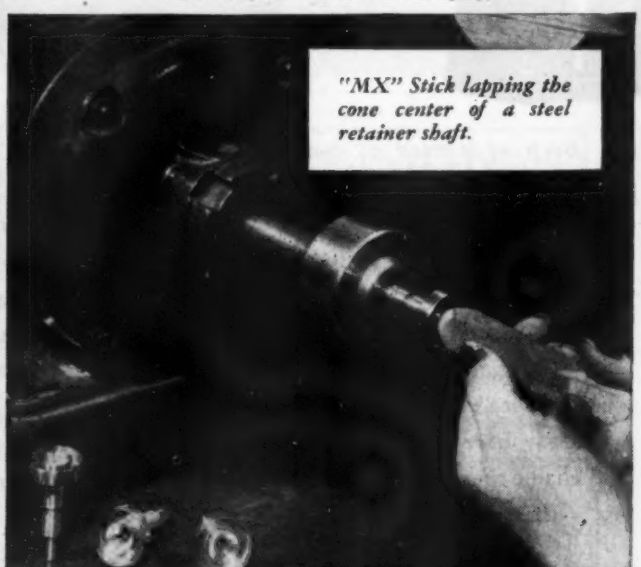
"MX" Mounted Wheels are ideal for grinding and finishing those hard-to-get-at-spots . . . and "MX" Sticks are unusually efficient for hand use on spinning work—for finishing and polishing.

"MX" IN ACTION . . . *These action shots demonstrate a few of the innumerable operations where the fast, smooth action of the "MX" Abrasive Tools are helping to turn out* better parts . . . in less time.

Burring and chamfering two edges simultaneously on flame-cut ports.

Burring operation on all surfaces of clutch plates fed four at a time into stack of thin tapered wheels.

(Carborundum and "MX" are registered trade marks of and indicate manufacture by The Carborundum Company)



"MX" Stick lapping the cone center of a steel retainer shaft.

"MX" Products

TRADE-MARK

THE CARBORUNDUM COMPANY, NIAGARA FALLS, NEW YORK

cutting action in WHEELS... MOUNTED WHEELS...STICKS

AN IMPORTANT ABRASIVE TOOL DEVELOPMENT
by Carborundum
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YOU WILL WANT THIS BOOKLET –IT GIVES YOU VALUABLE INFORMATION ABOUT "MX"... USES, RECOMMENDATIONS, GRITS, GRADES, SIZES
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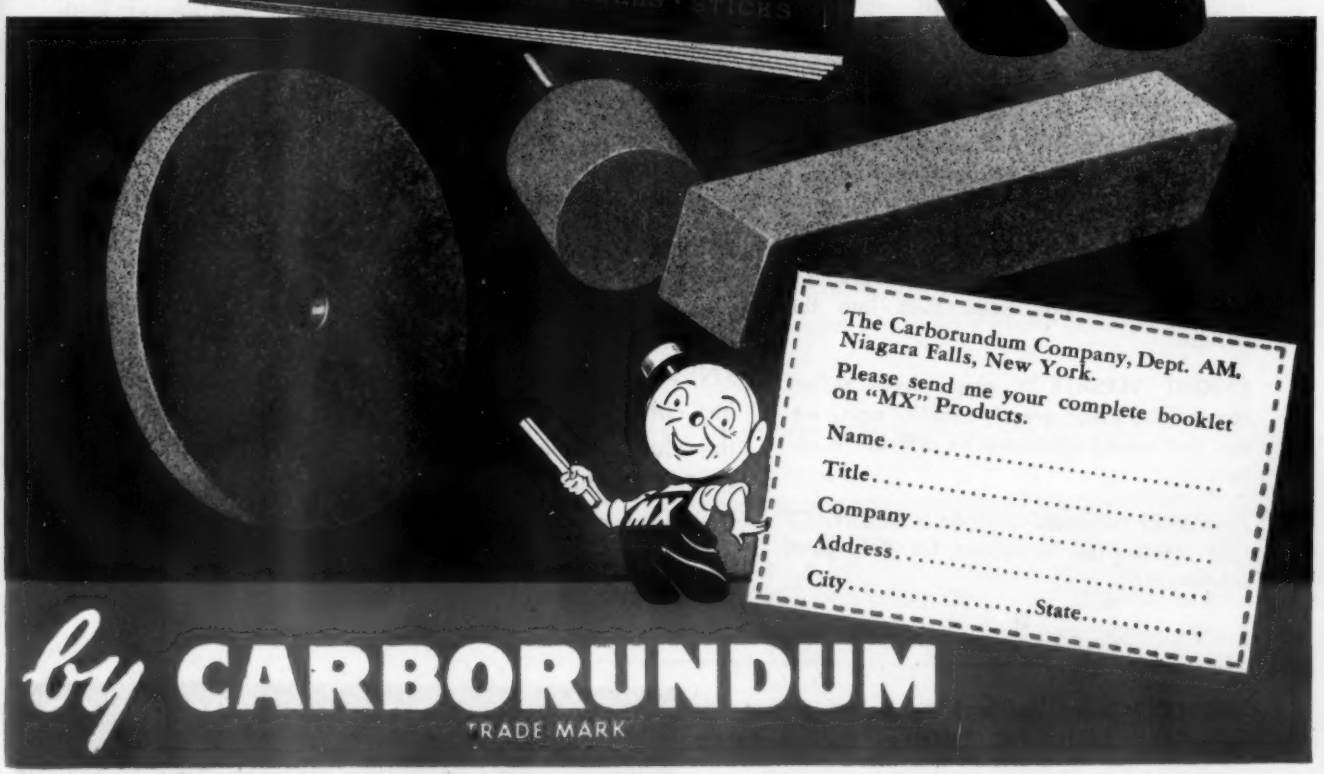

The Carborundum Company, Dept. AM,
Niagara Falls, New York.

Please send me your complete booklet on "MX" Products.

Name.....

Title.....

Company.....

Address.....

City.....State.....

by CARBORUNDUM

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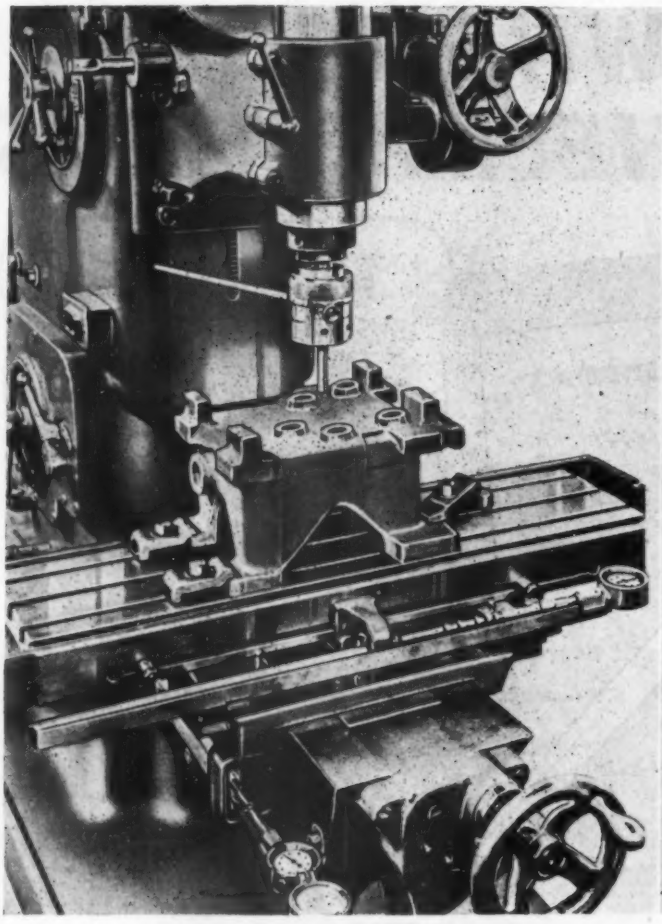

YOU CAN CHANGE *QUICKLY* FROM ONE JOB TO ANOTHER *with a* KNIGHT Miller

KNIGHT VERSATILE MILLERS ACCURATE - RIGID

Balanced Qualities of the KNIGHT Miller adapt it to each job - - - - -

KNIGHT Miller BALANCE includes CAPACITY, which enables users to turn out quality work at greater speed.

Plus this there is ACCESSIBILITY which makes possible more efficient operation — faster manipulation, and quicker set-ups.

To also aid in increasing production volume and insuring high standards of workmanship, RIGIDITY has been built into the design.

KNIGHT VERSATILITY gives these Millers capabilities which greatly simplify many set-ups that would otherwise be difficult to obtain.

Among the balanced qualities is ACCURACY that meets rigid inspection for finish and tolerances.

●

★ The all-purpose KNIGHT Miller can take your job in quickest time, with least amount of equipment, with elimination of hours of layout time, and with least effort for the operator. Large work or small — milling or boring, roughing, or accurate finishing cuts — all are handled to equal advantage on this wide range, easy to operate machine. Sixteen changes in speed in either direction give the spindle ample range to meet a wide variety of requirements.

All tool changes are made at the spindle nose. The KNIGHT Miller method of holding, driving, and changing cutters is positive, quick, and dependable. When the clutch is disengaged, a brake on the main drive shaft stops the spindle immediately, regardless of speed. You have an advantage in this for your operators can manipulate faster and make quicker set-ups — including the difficult ones.

KNIGHT Millers subject to prior order for immediate delivery. Write for catalog.

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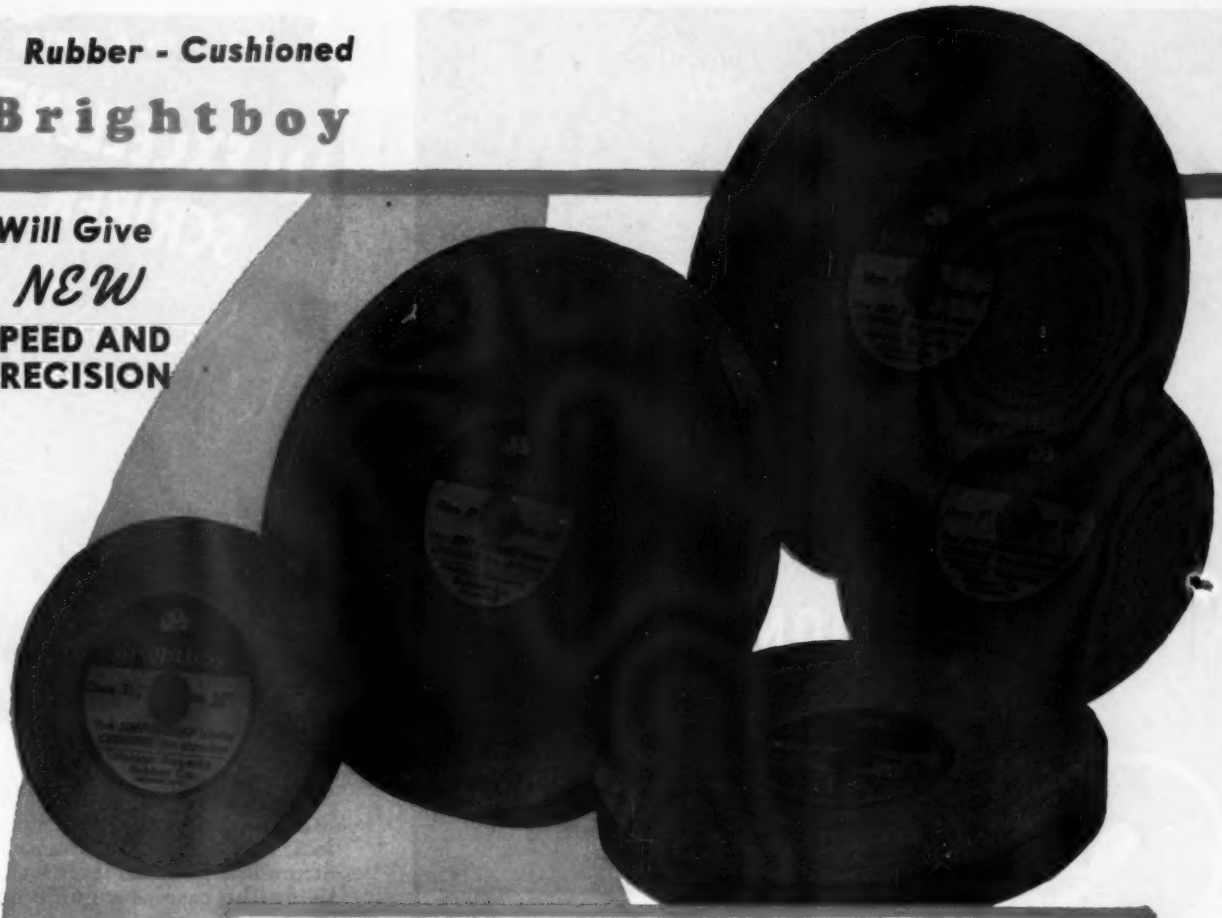

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Brightboy polishes as it de-burrs and finishes; the rubber and abrasive *work together* in a single action which eliminates the step-by-step operations between the grind and the buff. A Brightboy finish frequently serves as the final polish. No special preparation is required before use.

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For individual parts of 50 pounds to 15 tons, get in touch with SOMMERFELD.

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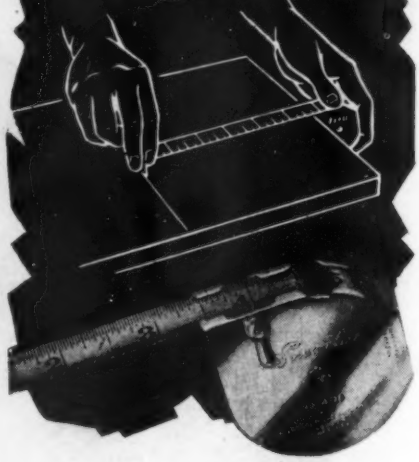

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Every Streamline comes complete with easily inserted spare blade which doubles the life of the rule.

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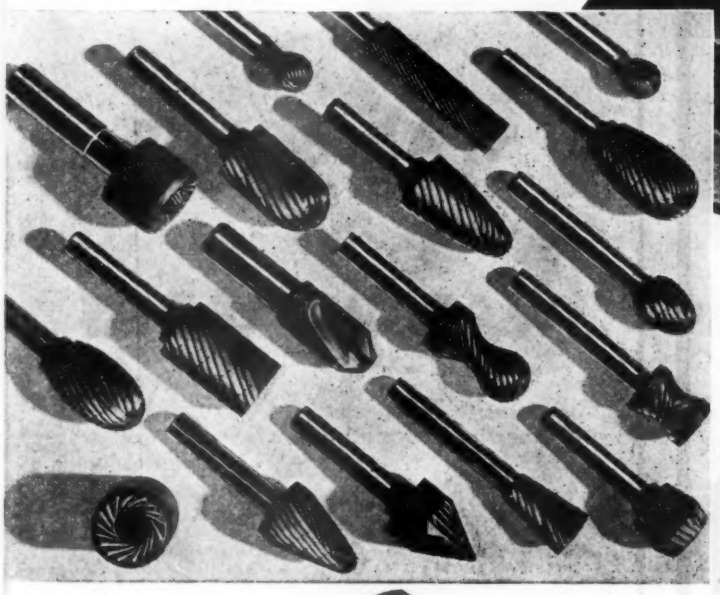

Severance Midget Milling Cutters and special cutting tools of many types are available, with Severance tooth design, for finishing every kind of wood, plastic, metal and alloy. These fast-working tools take sharp bites, throw off clean chips. For best service, order new cutters and send your worn cutters for regrinding to the nearest Severance plant.

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Faster, more accurate milling with carbide-tipped

Cal-Cutters saves production time

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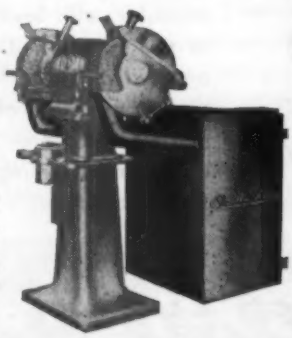
DUST GRIT

—is the plight of Dust and Grit when the AIR MASTER is installed on your grinding and buffing machines. No longer can these two destroyers of health and machinery menace your plant. No longer can these destructive saboteurs, Dust and Grit, cause absenteeism and expensive machinery breakdowns. The AIR MASTER liquidates them—definitely and completely.

What is sad for Dust and Grit is good for you. The Cincinnati AIR MASTER sucks up Dust and Grit right off your grinder and buffer wheels—and does it right at the moment they fly off the wheels. Human lungs and sensitive moving parts and bearings on expensive machinery are no longer injured by these flying destroyers.



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The AIR MASTER is fully self-contained . . . efficient, rugged, dependable.

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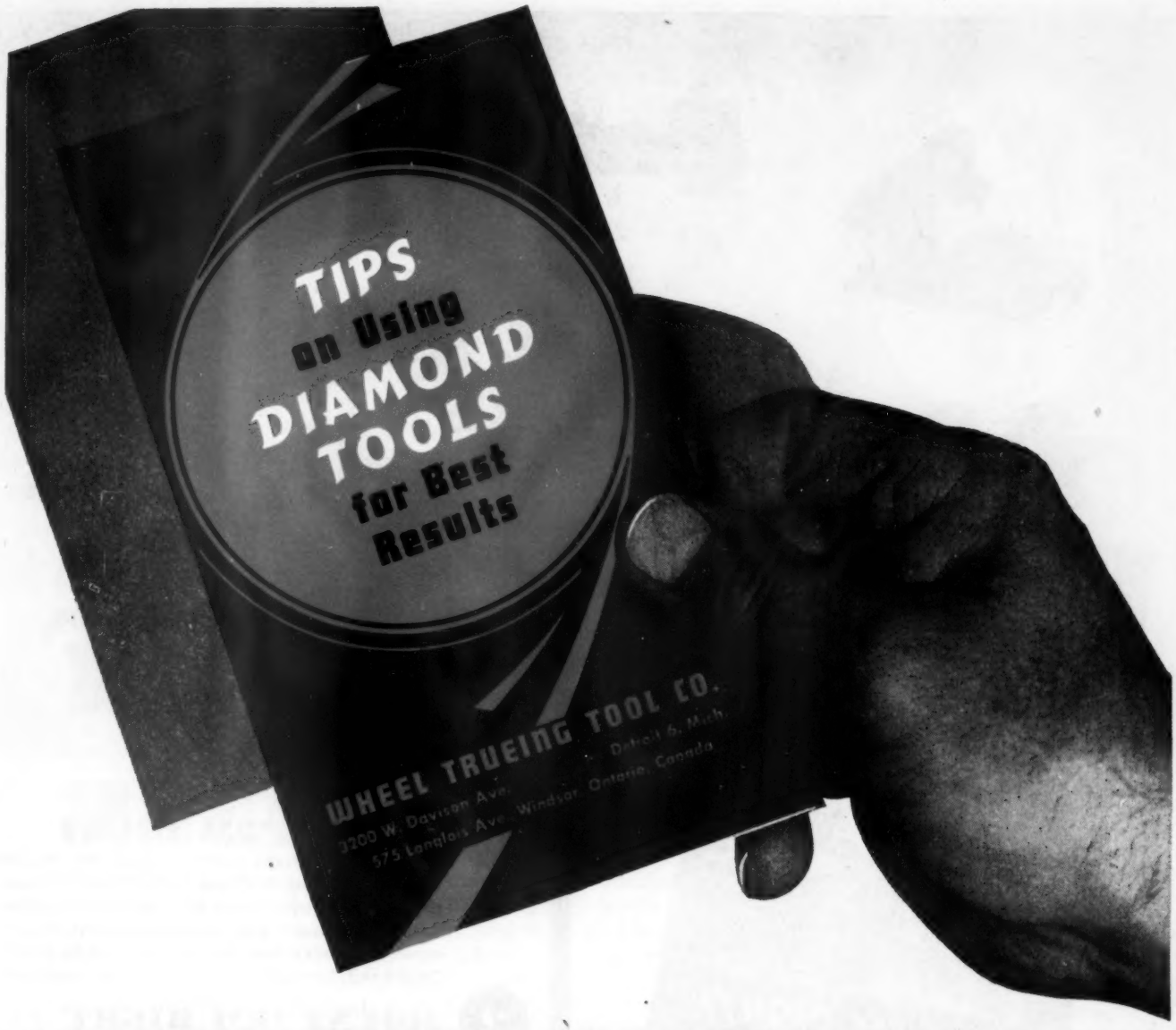
Invest to the limit!



THIS FREE BOOKLET FOR YOUR OPERATORS WILL SAVE YOU MONEY ON DIAMOND TOOLS

Every day, in plants all over the country, time is lost, production is reduced and the quality of grinding is lowered because of inexperience in the use of diamond tools.

The diamond tools themselves also suffer through misuse and so do the grinding wheels upon which they are used.

This condition is the natural result of wartime expansion and the unavoidable necessity of using inexperienced operators, without having the opportunity to train them properly.

In order to remedy this condition, Wheel Trueing has prepared the booklet shown above. We would like to send you a copy free of charge.

This book tells why grinding wheels need dressing and when and how they should be dressed. It describes and illustrates the correct method for setting up and using the diamond tool. It discusses common defects in dressing technique and shows the results on the actual work. It tells how to avoid misuse and abuse of valuable diamond tools, how to avoid excessive resetting cost, how to get more work from these tools through proper use.

Write for your free copy TODAY.

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FACTORIES

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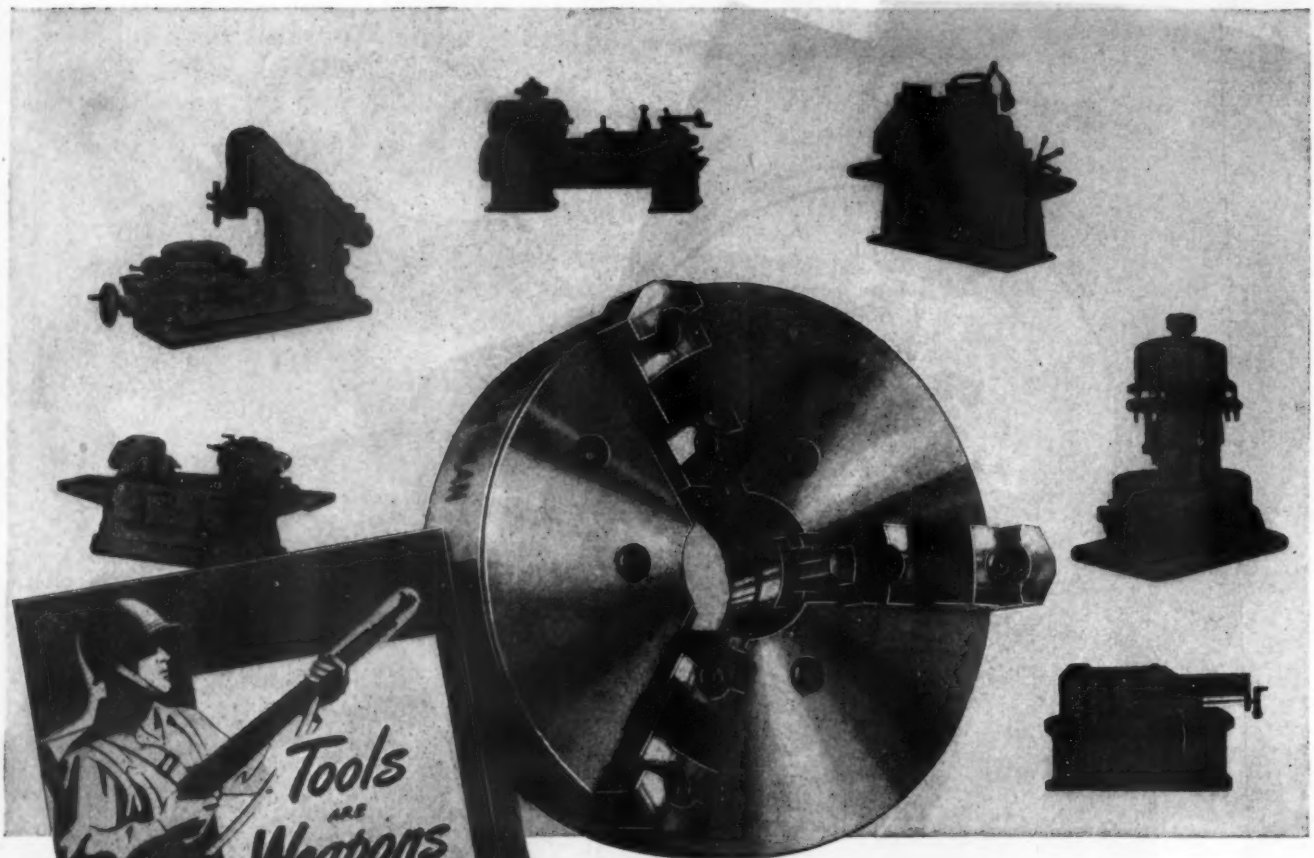


with CHUCKS that means...

1 CHOOSE 'EM RIGHT

... choose the right type of chuck for the job and the right size of chuck for the work. Choose the jaw equipment that will give you required flexibility for your shop. Avoid any temptation to overload chucks that are too small or to permit "make-shift" set-ups with incorrect jaw equipment.

2 MOUNT 'EM RIGHT

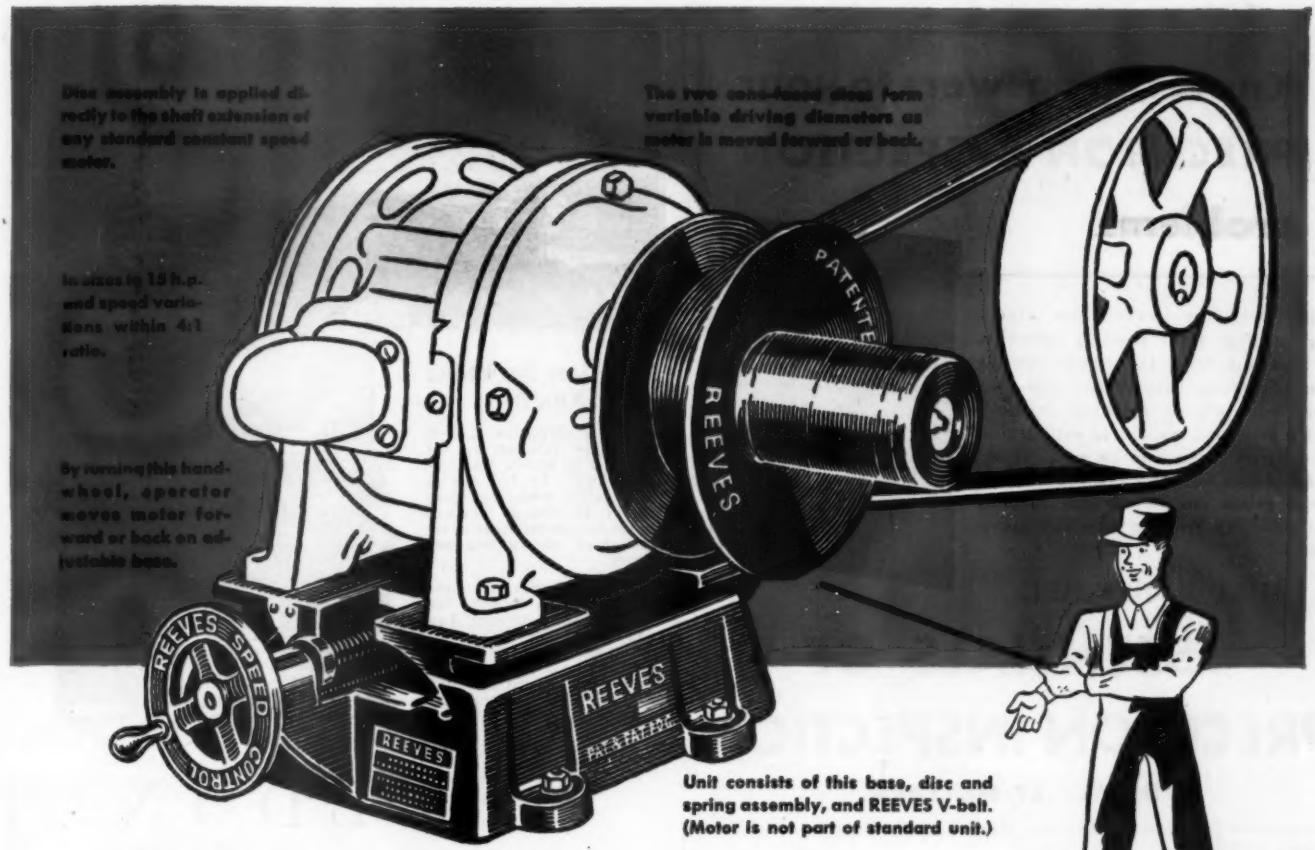
... the very ease and speed with which chucks can be mounted on any of the new standard spindle noses (American Standard, Cam Lock, Long Taper Key Drive) tends to cause some carelessness. ALWAYS be sure ALL bearing and seating surfaces are clean ... free from dust, chips, etc. Never force chucks into seating. Otherwise accuracy will suffer.

3 USE 'EM RIGHT

... regular lubrication, keeping surfaces clean, avoiding over extension of jaws, care in opening and closing ... these little things will help you prevent delays, work spoilage and waste. We have prepared small "Chuck Check" maintenance cards that emphasize these important points. A supply for distribution to your operators will be furnished free on request. The Cushman Chuck Company, Hartford, Connecticut.

CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION

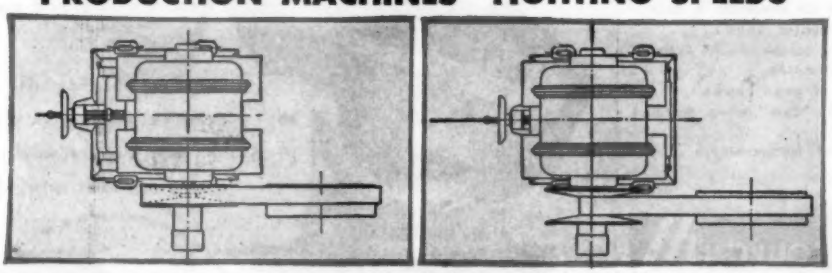

Disc assembly is applied directly to the shaft extension of any standard constant speed motor.
In sizes to 15 h.p. and speed variations within 4:1 ratio.
By turning this handwheel, operator moves motor forward or back on adjustable base.
The two cone-faced discs form variable driving diameters as motor is moved forward or back.
REEVES SPEED CONTROL
REEVES
REEVES
REEVES
PATENTED

Unit consists of this base, disc and spring assembly, and REEVES V-belt. (Motor is not part of standard unit.)

REEVES VARI-SPEED MOTOR PULLEY

Two cone-faced discs are mounted on the standard motor shaft extension. Motor is mounted on adjustable base. Through handwheel control, motor is moved forward or back, varying depth of throat between discs. A REEVES V-belt, running between discs and connected to driven machinery, is kept under constant tension by a compression spring. As depth of throat is varied, V-belt assumes different diameters of contact against discs. Speed adjustments are infinite between the limits, and are made while equipment is running. Constant torque; variable horsepower.

REEVES OPERATING PRINCIPLE THAT GIVES PRODUCTION MACHINES "FIGHTING SPEEDS"



Maximum speed—motor nearest to driven pulley Minimum speed—motor farthest from driven pulley

THESE VITAL ADVANTAGES for War Production

FULL-RANGE SPEED ADJUSTABILITY: Not just steps in speed, but any speed—to meet changes in size, shape, periphery or type of work.

NO WASTE IN TIME OR MATERIALS: Speed can be adjusted to skill of workers, to prevent waste and spoilage. Speed changes made without stopping driven machine. Valuable aid to new workers.

OPERATING PRINCIPLE PROVED in 260,000 installations, including use as standard equipment on 1,885 different makes of machines.

NATION-WIDE ENGINEERING SERVICE: REEVES engineers in 36 leading industrial centers will help you choose the proper unit and apply it correctly.

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REEVES Accurate Variable Speed Control

Know the answers to your PRECISION INSPECTION problems

Here, to help you answer those perplexing questions about precision inspection, is important, timely information covering inspection from many angles. This practical work manual helps the mechanic at the bench and machine as well as those who inspect and pass on his work. It lays a foundation on which even an inexperienced person can develop skill in using and adjusting precision tools and instruments.

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By WESLEY MOLLARD

Journeyman Toolmaker; Instructor, Machine Shop, George Junior Trade School, Detroit

8½ x 11, 207 pages, 243 illustrations, 40 blueprints, $3.00

This book, written for the author's National Defense classes in Detroit, presents easily understood and well-illustrated information on types and uses of inspection instruments, methods of use, how to check them etc. Have at your fingertips the use of the V block, the cutter-clearance gage, the depth micrometer, the vernier caliper, the adjustable parallel, the optical comparator and many other instruments discussed in detail in this book. The material is so arranged that the reader gradually goes from the elementary to the advanced problems meanwhile acquiring skill in reading and in using the different precision tools. Inspectors will find many pointers leading to special advanced precision inspection.

CONTENTS:

1. Inspection Tools and Gages
2. Rules
3. Micrometer Calipers
4. Vernier Gages
5. Checking Holes
6. Knurling - Carburizing - Sandblasting
7. Gage Blocks and Attachments
8. Sine Bar
9. Milling Cutters-Key Slots
10. Threads
11. Problems
12. Gears

Some vital points covered:

- how to set a sine bar
- how to check an angle with the sine bar
- how to adjust an inaccurate micrometer
- how to hold a micrometer caliper correctly
- the seven factors in checking a hole
- how to read a vernier gage
- how to transfer a measurement from a caliper to a micrometer
- the three grades of gage blocks
- how to acquire the "feel" when measuring with gages
- the importance of temperatures

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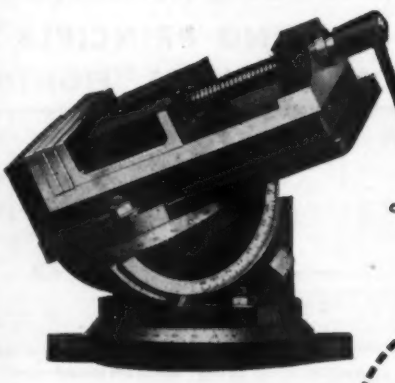
SAVE TIME ON INTRICATE ★ ANGULAR SET-UPS ★

MULTI-SWIVEL VISE



Fully universal . . . three swivels simplify the setting of compound angles.

Parts interchangeable . . can be used as a plain flanged vise, a swivel vise or a multi-swivel vise.

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

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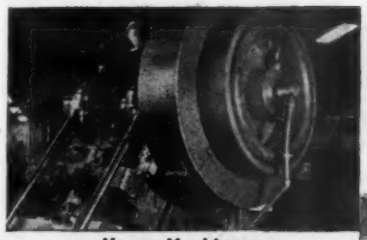
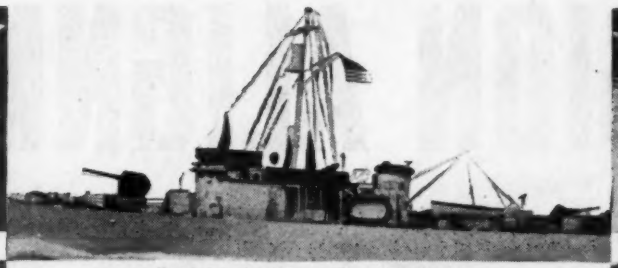
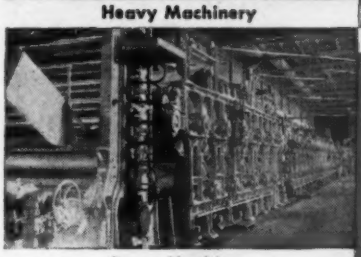


Heavy Machinery

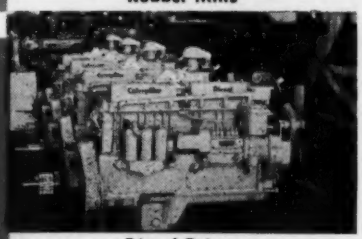


Destroyers — Tugs — Landing Craft

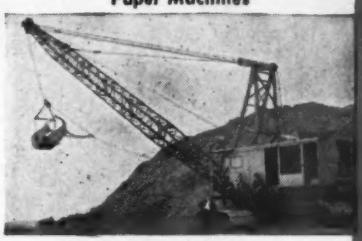
Rubber Mills



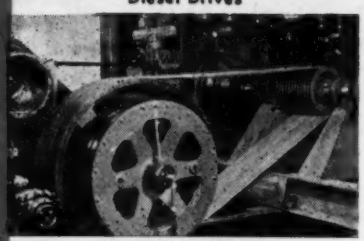
Paper Machines



Diesel Drives

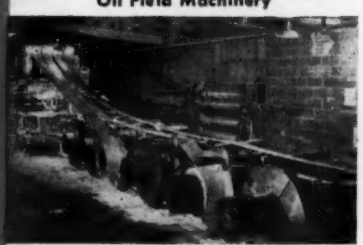


Drags and Cranes



Oil Field Machinery

Mine Hoists



Steel Mills

The CLUTCH with a WAR RECORD

Wherever the going is *tough*—where heavy-duty drives *must* deliver unquestioned performance —the Fawick Airflex Clutch is making records.

On thousands of Diesel-driven Naval vessels, and throughout the entire range of war industry, this Clutch is absorbing shocks and vibration, without springs, levers, arms or toggles. No moving parts—no adjustments to make—no lubrication required—low maintenance costs. Power and torque are completely controlled by air pressure.

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POWER CONTROLLED BY AIR

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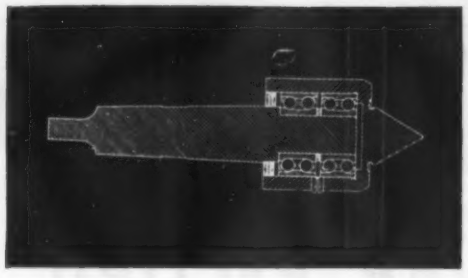

4

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QUADRO Precision LIVE CENTERS will outlast old-fashioned solid centers to pay for themselves quickly. They combine the rigidity of the solid lathe center with the frictionless properties of the ball-bearing to form a tool which will increase production without sacrificing accuracy. Manufactured in all tapers and sizes.

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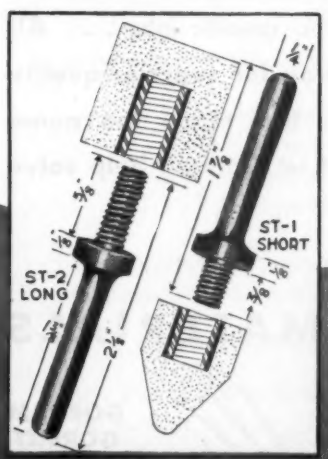
839 BROADWAY NEW YORK 3, N. Y.

QUADRO *Precision* LIVE CENTERS

Solve
YOUR DIFFICULT GRINDING PROBLEMS *with* STERMOUNT

or your rough or accurate work . . for cleaning, sharpening, cutting nd polishing of hard-to-reach locations, Sterling's Stermount Wheels nd Points are ideal. They have wide application on all types of etal, having the correct shape, size, grain and bond to do the most nusual kinds of grinding. In short, Stermounts are tailor-made to fit your job!

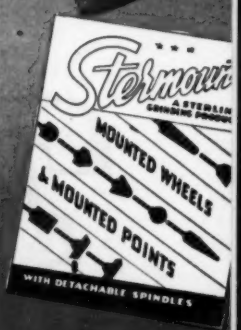


Removable spindles are an economical feature. When your wheel or point finally wears down, simply add a new one—the same spindle can be used over and over again.

The unusual care employed by Sterling in creating every Stermount item makes it possible for you to complete jobs with them quickly and accurately. Their toughness imparts longer grinding life, thereby adding unusual economy to their many other desirable features.

Stermount grinding applications are limitless. There are literally thousands of unusual jobs that these modern wheels and shapes can make easier.

In your plant, there are many opportunities to cut production costs with Stermount Wheels and Points. A Sterling engineer will help you take advantage of them by recommending the types best suited to the demands of your grinding problems. Write today for quick delivery.



Send today for the new S mount folder . . contains c plete descriptions, prices

· STERLING ABRASIVES ·

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

. . portrait of a versatile family

GORHAM

HIGH SPEED STEEL GROUND TOOL BITS

The Gorham "family" of Ground Tool Bits is truly versatile . . . While the Gorham Standard bit is well suited to do—and do well—a great variety of cutting jobs, other members of the Gorham family can efficiently "take over" on certain hard or abrasive materials. Almost no application can "stump" this tough family! . . . In other words, the Gorham line of Ground Tool Bits includes cutting materials *to do specific jobs* . . . All backed, of course, by Gorham's reputation for superior quality and performance—a reputation which has made the name Gorham "Tops" in industry . . . Why not let Gorham help solve *your* tool bit problems?

3 DISTINCTIVE CUTTING MATERIALS

GORHAM STANDARD
For the commercial field

GORHAM M-40-B
For heavy cuts in hard material

GORHAM GORMET
For more abrasive materials

GORHAM TOOL COMPANY

14400 WOODROW WILSON AVENUE
DETROIT 3, MICHIGAN

Will These TWELVE Be Revealed When You Check Your Grinding Compound?

WHEN you use Oakite Grinding Compound, you are employing a coolant that has been successfully used throughout industry for over 35 years. It is a performance-proved oil-water emulsion that, under practically every conceivable service condition, has made possible improved grinding on a wide variety of work. Note, for example, whether you are getting from the grinding compound you use the following TWELVE advantages which Oakite Grinding Compound assures:

1. *Maximum cooling*
2. *Proper lubrication*
3. *Rust prevention*
4. *Fine precision finishes*
5. *Clean, free-cutting wheels*
6. *Less loading and glazing*
7. *Fewer wheel dressings*
8. *Longer wheel life*
9. *Clean, odor-free solution*
10. *Quick settling-out action*
11. *Clean supply lines*
12. *Economical*

The experience of innumerable users year after year indicates Oakite Grinding Compound fully and successfully meets all the fundamental requirements of the ideal coolant for grinding.

GRINDING MANUAL FREE!

This 20-page manual contains formulae and other helpful information for making up both Oakite Grinding and Cutting Compounds. The data is particularly intended to help you obtain improved results, step-up production, lower costs. Your copy is FREE! Won't you write for it TODAY?

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Technical Service Representatives in All Principal Cities of the United States and Canada

OAKITE CLEANING

MATERIALS METHODS SERVICE

FOR EVERY CLEANING REQUIREMENT

TAPPING TIPS

From Woody Spencer's Notebook

THREAD DEPTHS

The "longer thread, more strength" idea may have its points but most of the fellows I've talked to agree that it's best to design threaded parts so that engagement is 1½ times the diameter with 75% of full thread. This serves to stress the male member before the female thread. It also reduces the trouble ordinarily encountered in excessive thread depth and holds tap breakage possibilities to a minimum. When too much length of engagement is specified, some of them recommend counterboring or relieving beyond the required amount of thread.

"Woody Spencer's Notebook" is our way of trying to pass along ideas and tips we've accumulated through the years we've been making fine taps. Tapping success, however, depends on so many variables that the suggestions we make may not work in every case. We've seen them work enough times though to make us think tapping men may find them worth while.

Almost every tapping operation presents individual problems so we cannot suggest too strongly that you send us complete details of any tapping problem (material, diameter, depth, etc., etc.) our engineers will be glad to make specific recommendations covering your specific problem.

** Note: Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Watch for them.*

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company

Cleveland 3, Ohio

HELPFUL INFORMATION FOR TRAINING NEW WORKERS ON MILLING OPERATIONS

A 16-page, illustrated, practical training course on milling. The beginner coming to the shop from non-industrial life or the candidate for up-grading from some simpler shop operation will find here background information about the machines and tools he will use, how they should be handled, what he can do with them.

Appearing originally in *American Machinist* as No. 3 in the series of special training sections on "Tools of Our Trade", the demand for this feature in reprint form clearly indicates the value placed upon it.

Send for the number of copies you need while they are still available. Price 10c each; less in lots of 500. Use coupon below.

MAIL COUPON TODAY!

AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Please send me _____ copies of "How to Run a Milling Machine". Enclosed is $_____ (In stamps, check, money order)

Name _____

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Address _____

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AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

THE LIGHTNING SCREW PLATE &
THIS SCREW PLATE CUTS WIRE
SIZES FROM NO.2 TO NO.18.
AND TAPS & DIES MAY BE USED IN
A MACHINE OR BIT BRACE IF DESIRED.
HOLDERS FOR THESE PURPOSES BEING
INCLUDED IN THE SET. DIES & TAP
WRENCH ADJUSTABLE WITHOUT SPRINGING
AVOIDING ALL DANGER OF BREAKING -
LIGHTNING

FROM OUR CATALOG OF 1875

This quaint wood cut was reproduced from the pages of the 1875 catalog of the Wiley & Russell Manufacturing Company, one of the parent companies of the Greenfield Tap & Die Corporation. It shows the "finest threading tools" of that time and the copy modestly states "it is warranted to do five times the work that can be done in the old way."

Now GREENFIELD'S NEWEST CATALOG

Here is a valuable new addition to the library of all who are concerned with the purchase or use of Taps, Dies, Gages, and other small tools. The pages of Greenfield's new Catalog No. 44 include complete and up-to-date listings of sizes and styles, plus a wealth of technical data that will help the engineering and production staffs of every metal-working industry as they work on war and post-war products.

The new catalog has been most carefully indexed and arranged for quick reference. Copies are available from your local "Greenfield" Distributor.

GTD GREENFIELD

GREENFIELD TAP & DIE CORPORATION

GREENFIELD, MASSACHUSETTS, U. S. A.

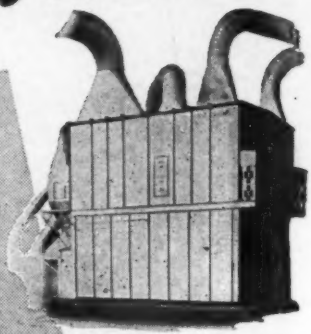
GET 60 MINUTES WORK OUT OF *Every Man Hour!*

WATCH YOUR DUST . . . .

AMONG factors governing workers' output, the condition of the air in your plant is one of the most important. Air containing a relatively high percentage of dust slows down individual capacity of both men and machines, lowers efficiency . . . and in time serves to undermine health and breed insidious *absentee-ism.*

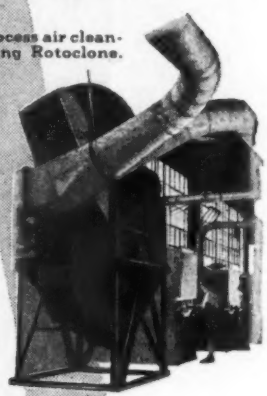
Faced with such problems, many of America's leading manufacturers have found the ideal solution in really *modern, efficient,* Dust Control Systems designed and installed by Kirk & Blum Engineers.

Our 37 years of specialized experience is your assurance that a K & B system *will* help protect your workers' health, save man-hours, cut costs, speed output. You'll be better equipped to maintain top production now . . . and better equipped to win in the post-war "battle for the markets."

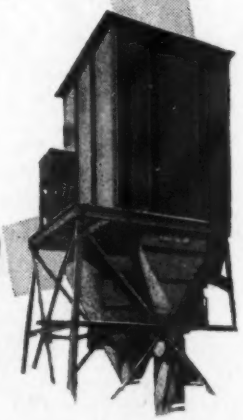


Clean dry returnable air required. Cloth filter selected.

Wet process air cleaning using Rotoclone.



Centrifugal separator suitable for heavy dust concentration.



Combination of centrifugal separator and dry filter.

Write for any of these Booklets:

"Dust Collecting Systems in Metal Industries"

"Blower Systems for Woodworking Plants"

"Fan Systems for Various Industries"

"Industrial Ovens"

"Cooling Systems for the Glass Industry"

"Data on Kirk & Blum Production facilities"

THE KIRK & BLUM MANUFACTURING CO
2823 Spring Grove Ave., Cincinnati 25, Ohio

KIRK AND BLUM

Now you can carburize selectively in liquid baths!

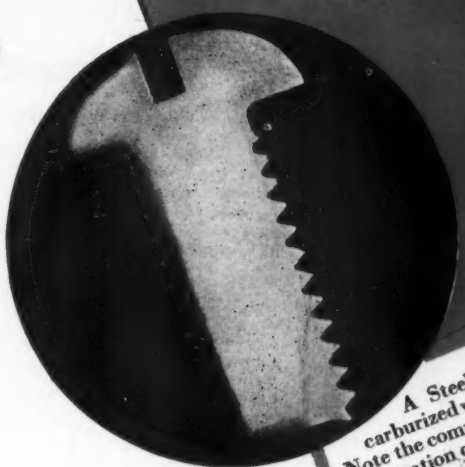
An example of selective carburization with "NO-KASE". Note the clear cut line of demarcation between the protected and unprotected areas. (Treated in PARK-KASE for 3 hours at 1600° F.)

Park

"NO-KASE"

(Patent Applied For)

A new kind of stop-off paint



A Steel bolt selectively carburized with "NO-KASE". Note the complete lack of carbon penetration on the protected section of the bolt. (Treated in PARK-KASE for 3 hours at 1600° F.)

●Park "NO-KASE", a new development in stop-off paints provides positive protection against carburization in liquid carburizing baths. When you apply "NO-KASE" even the most difficult sections, such as threaded edges (see photograph at right) are protected from carburization.

Park's "NO-KASE" is applied as paint and is easily confined to the area where protection is desired. Because it is quick drying "NO-KASE" can be immersed in the carburizing bath approximately one hour after the part is painted.

The vehicle of "NO-KASE" paint burns out when subjected to the heat of the bath, thereby leaving the pigment as a continuous metallic coating.

SEND IN YOUR ORDER FOR "NO-KASE" TODAY OR WRITE FOR PARK BULLETIN E-16 WHICH GIVES YOU COMPLETE INFORMATION AND PRICES

Park

PARK CHEMICAL CO.

DETROIT . . . MICHIGAN

Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement.

8074 MILITARY AVE. DETROIT, MICH.

Thor BANTAM ROTARY AIR GRINDERS

A HANDFUL OF POWER FOR HUNDREDS OF JOBS

For All Small-Wheel Work

The new Thor "Bantam" Rotary Air Grinders are the ideal small-wheel grinders for shop, laboratory, or work bench. They handle all accessories; work in practically every material. Have the right speeds and power for grinding with abrasive wheels and points; for cutting with rotary files; routing with steel cutters; polishing with felt and soft rubber polishers; cleaning with wire brushes; and for sanding.

SMALL • LIGHT • POWERFUL

The small size and light weight of Thor "Bantam" Rotary Air Grinders provide perfect one-hand operation. They handle easily as a pencil for accuracy on precision work; yet their power and sturdy construction assure continuous and efficient performance on hard jobs.

Thor Rotary Air Grinders of the "Bantam" type are available in speeds from 7,000 to 21,000 R.P.M.; in weights from 20 ounces to $5\frac{1}{16}$ pounds; in lengths from $6\frac{3}{8}$ inches to 15 inches.

• SMALL-WHEEL GRINDING
Mounted abrasive points and wheels up to 2" diameter can be used in Thor "Bantam" type Air Grinders. Wheels are available in a wide range of sizes and grains for grinding all materials. Designed to fit the hand, the Thor "Bantams" provide perfect control, "finger-point" accuracy and dependable power for hundreds of jobs.

• CUTTING AND ENGRAVING
Because the Thor "Bantams" handle as easily as a pencil they are ideal for use with rotary files and steel cutters. Precision cutting, carving, beveling, routing and roughing in wood, plastics and metals is done rapidly and efficiently in minutes where formerly hours were required.

• POLISHING AND BUFFING
Superlative finishes on practically all materials are obtained by Thor "Bantams" when used with soft felt and soft rubber wheels. Hours of hard labor are saved and finer results are obtained with these fast, convenient tools.

• CLEANING AND SANDING
Cleaning, removing rust, and many other wire brush jobs are done faster and better with versatile Thor "Bantams."

Sanding discs and drum sanders used with Thor "Bantams" for use on wood or metal save much handwork.

Steel saws and rubber cutting discs for high speed operation with Thor "Bantams" cut light materials with lightning speed.

THOR AIR GRINDERS OFFER THESE ADVANTAGES

"Finger-Point" Accuracy—Thor "Bantam" Grinders fit perfectly in one hand . . . handle as easily as a pencil . . . provide "finger-point" accuracy.

Dependable Power—Thor one-piece rotor is perfectly balanced to revolve without vibration. Multiple blade construction insures quick action and instant starting under load.

Longer Life—Alloy-steel housings are die-cast for strength and long-lasting, continuous service.

These, and such other features as automatic lubrication, positive-lock of throttle for assured continuous operation and on some models, free rotation into any position with a swivel hose connection, are available in the *complete* line of Thor "Bantam" Type Air Grinders.

OOOH GRINDER

OOH GRINDER

10 GRINDER

	OOOH	OOO	OOD	OOH	10-18	10-15	10-10
WHEEL (Vitrified) CAP. (Bonded)	1¼"x½"	1½"x½"	1¼"x½" 1½"x½"	1½"x½" 2"x½"	1½"x½" 2"x½"	1½"x½" 2½"x½"	2"x½" 3"x½"
SPEED (r.p.m.)	20,000	14,000	21,000	17,000	18,000	15,000	10,500
WEIGHT	22 ozs.	20 ozs.	3-3/16 lbs.	5-1/16 lbs.	4⅜ lbs.	4⅜ lbs.	4⅜ lbs.
LENGTH	6¾"	6⅜"	9½"	13⅜"	15"	15"	15"

Learn today how Thor "Bantam" Air Grinders can save you time and money on hundreds of jobs. Write for Thor Catalog 52-B.

Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.

Branches in Principal Cities

Cartridge belt link plant—Ordinary quenching oils wouldn't do the job. With Gulf Super-Quench, production of links increased 30%, rejections were practically eliminated, and press downtime for reshaping dies was reduced 33%.

Shell fuse plant—With soluble oil as the cutting fluid, this machine drilled and tapped 700 parts per hour. With Gulf Cut-Aid—no other changes—production is approximately 1,000 per hour . . . a gain of 43%!

Textile mill—All-round better performance of Dobby looms with Gulf quality lubricants resulted in a 50% reduction in seconds.

How

Gulf Quality Petroleum Products

help increase output and reduce costs

These plants are typical of hundreds in every industry that have secured many worthwhile benefits directly as a result of the superior performance of Gulf quality lubricants, quenching and cutting oils.

Increased production, longer bearing and tool life, better finishes on machined parts, improved rust prevention, lower maintenance costs, and improved physical properties in many types of steel—these are some of the results industry is obtaining through the use of the proper Gulf petroleum products, as recommended by Gulf Service Engineers.

It will pay you to investigate these *more efficient production and maintenance tools.* Call in a Gulf Service Engineer today and ask him to give you additional facts on their quality and performance values.

Back the Attack . . .

Buy More War Bonds!

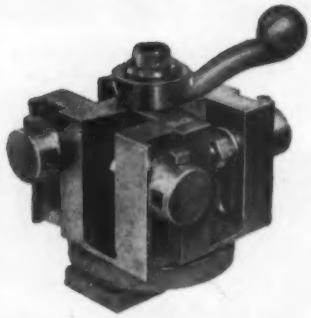
GULF INDUSTRIAL LUBRICATION

helps make machines produce more at lower cost

GULF OIL CORPORATION · GULF REFINING COMPANY · GULF BUILDING, PITTSBURGH 30, PA.

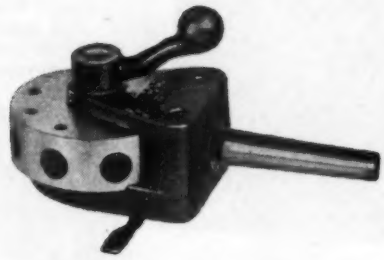
How to do turret lathe machining ... on your engine lathe!

THESE 3 SPECIALTIES LATHE ACCESSORIES MAKE IT POSSIBLE



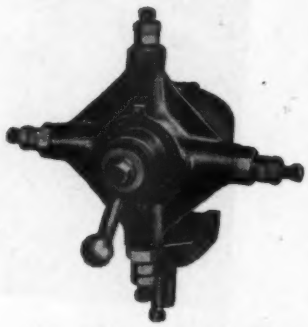
SPECIALTIES CROSS-SLIDE TURRET

Gives you four working positions without tool changes . . . allows multiple machining operations on one lathe. Easy to operate—merely flip the turret from one position to another. No. 30 for 9" to 12" lathes; No. 60 for 13" to 20" lathes.



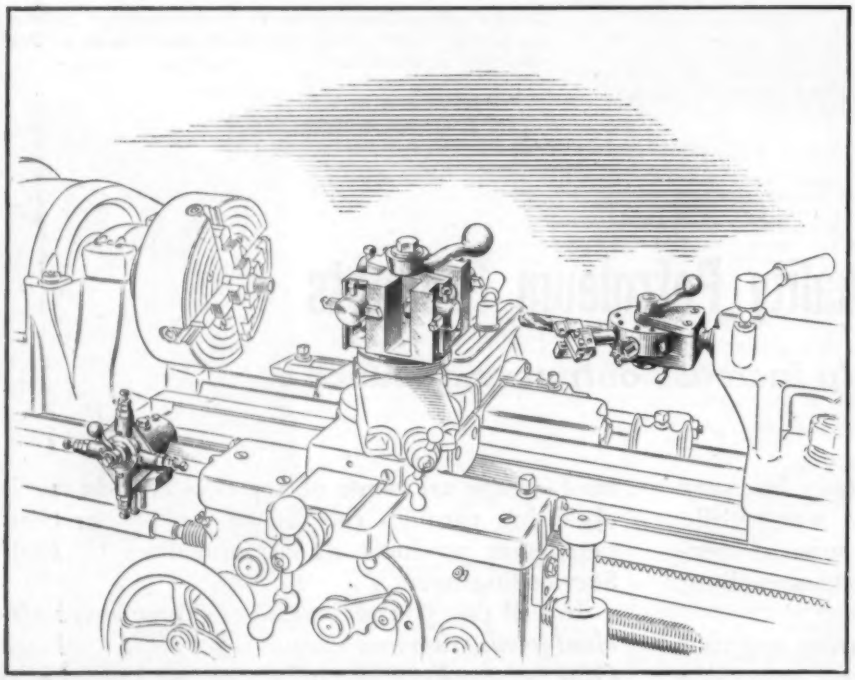
SPECIALTIES TAIL-STOCK TURRET

Quickly converts engine lathe into 4-way turret lathe for end work. You can perform four different operations with the four positions. No. 58 with No. 2 Morse Taper Shank; No. 103 with No. 3 Morse Taper Shank; No. 104 with No. 4 Morse Taper Shank.



SPECIALTIES LATHE STOP

For multiple operations — eliminates repeated measuring. You measure only once for each operation. Once the four positions are set, you just index. No. 10 for 9" to 12" lathes; No. 20 for 13" to 20" lathes.



CONVERT

YOUR ENGINE LATHE INTO A TURRET LATHE

Any lathe can be converted into a complete, accurate, precision turret lathe in *minutes* with these SPECIALTIES lathe accessories. Attached to your engine lathe, the SPECIALTIES Cross-Slide Turret, Tail-Stock Turret and Lathe Stop permit you to do any kind of work—forming, roughing, boring, finishing, tapping—without stopping the lathe or changing tools.

Mail the coupon for complete information about this SPECIALTIES production team designed to help you increase the capacity of your lathe and cut machining costs.

SPECIALTIES Manufacturing Co., Inc.
45 Farrand Street, Bloomfield, N. J.

Please send me full information on SPECIALTIES lathe accessories.

Name_____

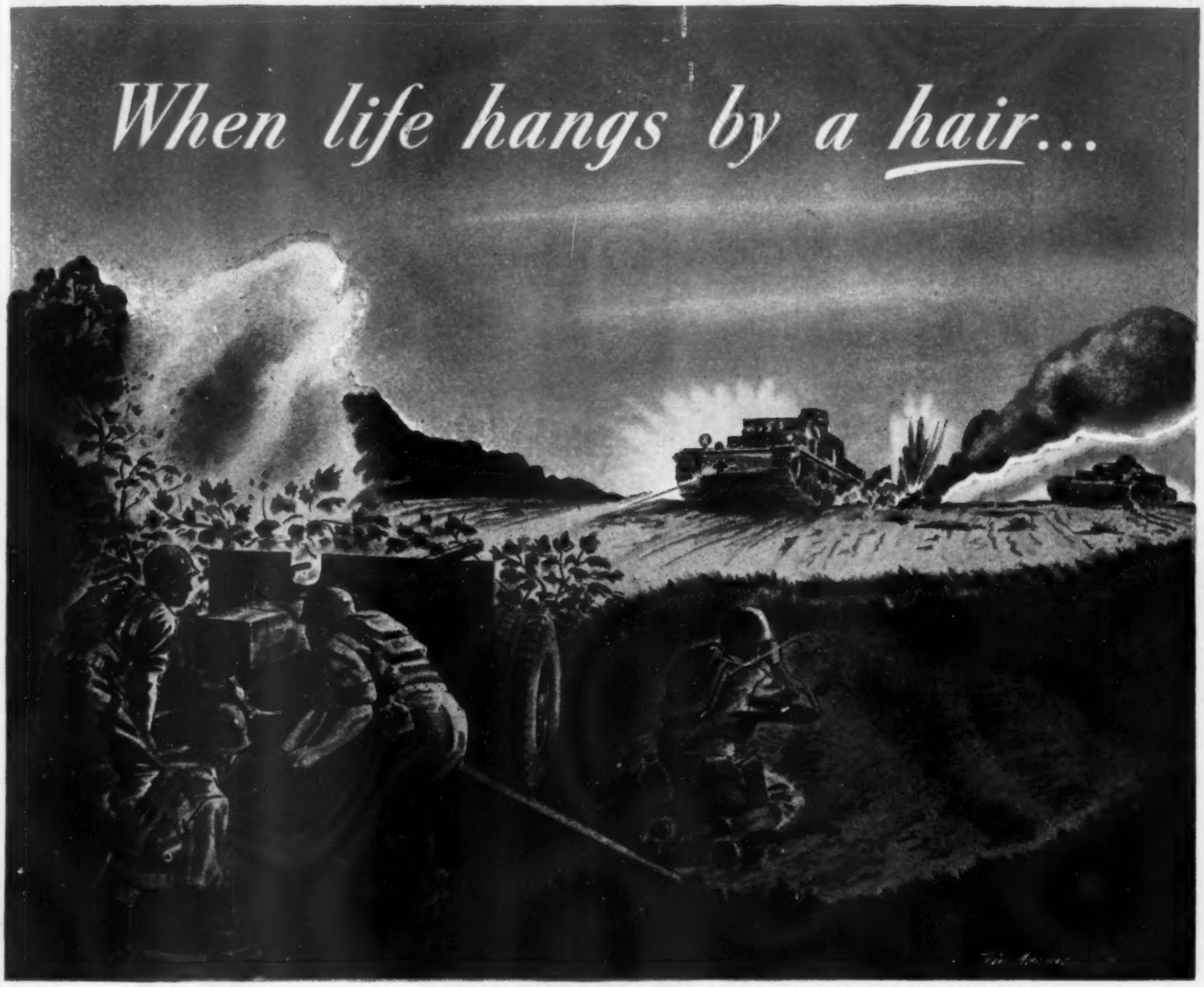
Company_____

Address_____

City_____ State_____

SPECIALTIES
MANUFACTURING COMPANY, Inc.

When life hangs by a hair...



We want YOU to know that the Life of your Brother, Son or Sweetheart will not be endangered because an over or under-sized shell caused the gun which is defending him to fail.

In battle, the lives of not only a gun crew, but of hundreds of other fighting men, may depend on the unfaltering efficiency of ONE artillery piece.

Hair-breadth accuracy in the gaging of Cartridge Cases is demanded by your Army and Navy, to make certain that all guns will be in there slugging it out with the enemy.

We are proud to have been selected by the Armed Forces to share the important responsibility of producing the gages which provide this assurance.

This same unfailing accuracy is found in ALL "Quality" Precision Inspection Gages, assuring the utmost in dependable gaging NOW and in the years of Peace.

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QUALITY TOOL & DIE CO.

Manufacturers of "Quality" Products

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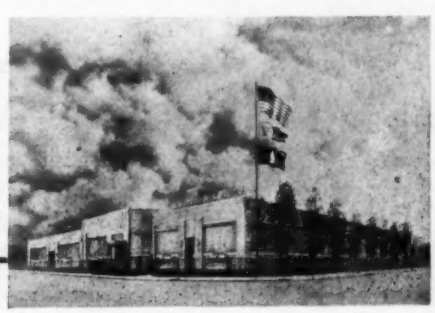
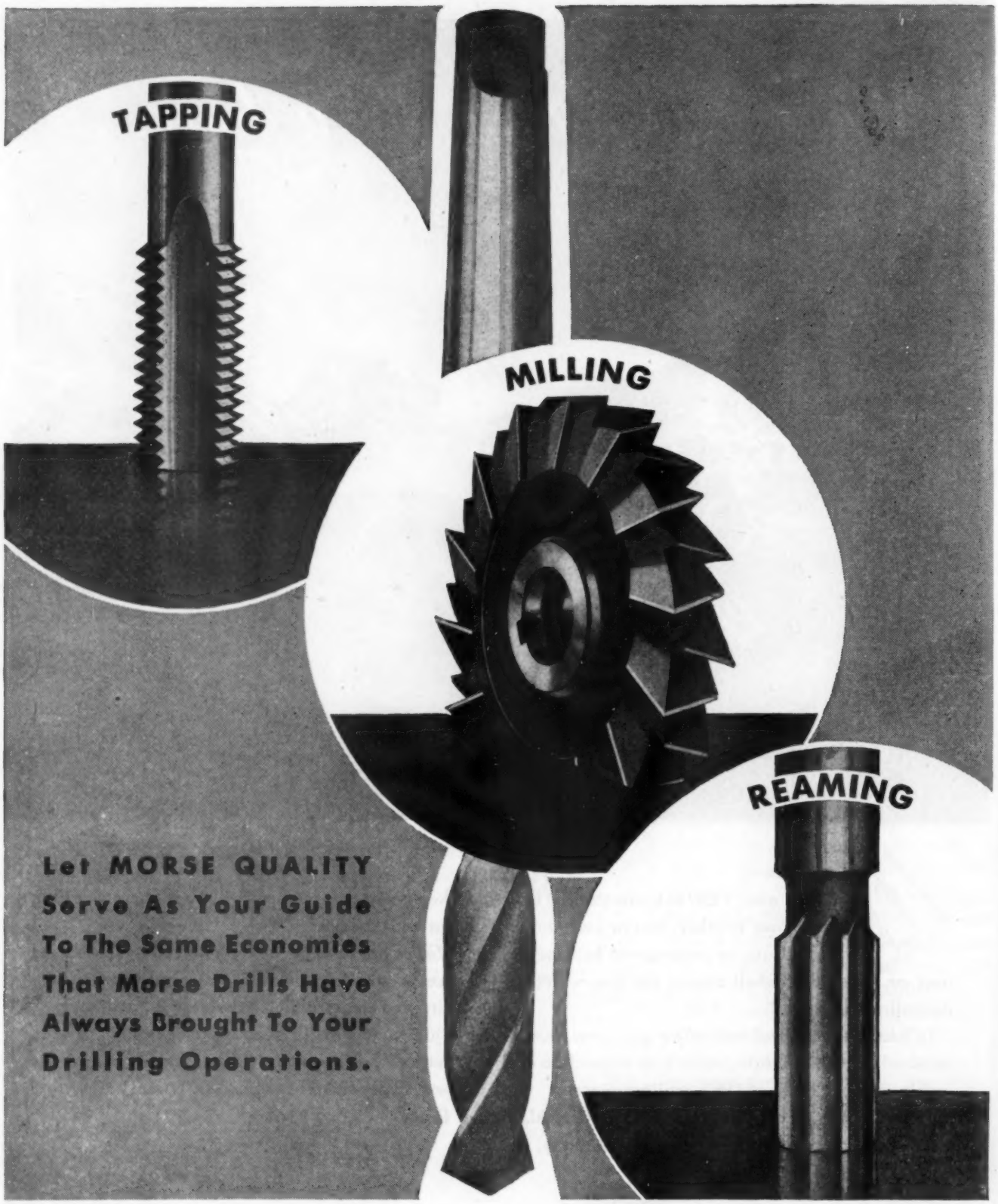




Let MORSE QUALITY Serve As Your Guide To The Same Economies That Morse Drills Have Always Brought To Your Drilling Operations.

MORSE

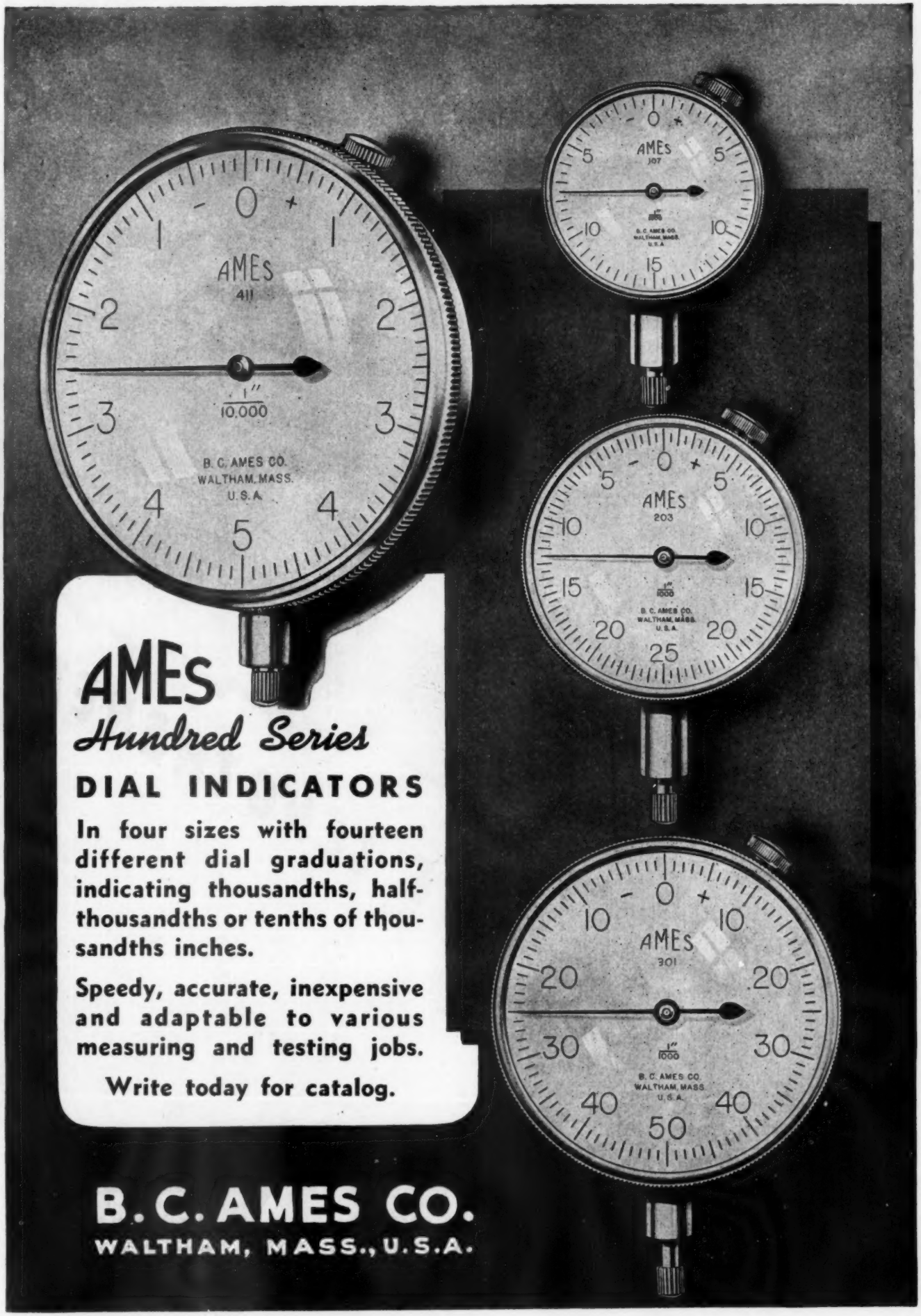
THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

SAN FRANCISCO STORE: 1180 FOLSOM ST.


AMES
Hundred Series
DIAL INDICATORS
In four sizes with fourteen different dial graduations, indicating thousandths, half-thousandths or tenths of thousandths inches.
Speedy, accurate, inexpensive and adaptable to various measuring and testing jobs.
Write today for catalog.
B. C. AMES CO.
WALTHAM, MASS., U.S.A.
AMES 411
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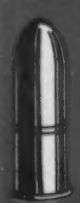
AMES 107
AMES 203
AMES 301

THREADING SPEED

FINER FINISHES



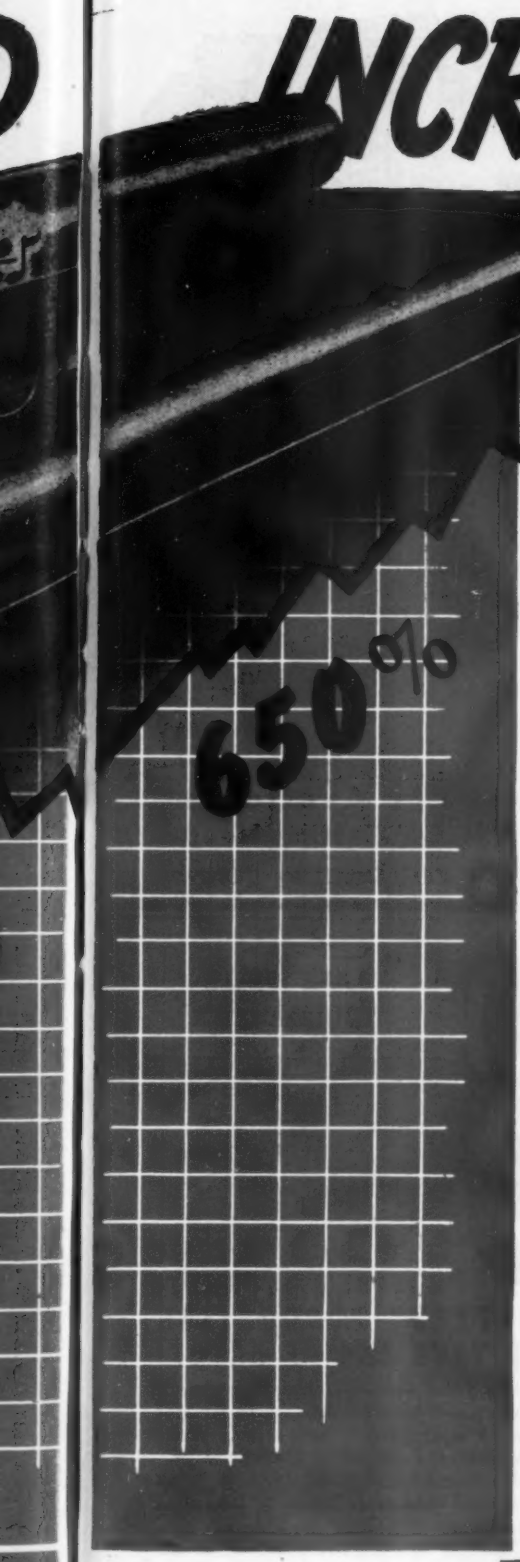
The finer finishes achieved with Tycol cutting oils are exemplified by the experience of one big eastern ordnance producer. Finishes improved on cylindrical and centerless grinding of shells, using a 40 to 1 Tycol mix—half the concentration previously required.

LONGER TOOL LIFE

Longer tool life to the tune of 1,181% increase in taps per grind was obtained when this manufacturer switched to Tycol Soluble Oil. The taps now tap 2,480,000 nuts as compared with the 210,000 before using Tycol.

FASTER CUTTING

Tycol Sulphurized Cutting Oil speeded up gun boring 84% for an ordnance plant—from 88 to 125 inches per hour! Better finishes, more accurate boring resulted, too, because Tycol eliminated excess build-up on tool edges.



INCREASED 190%

with

TYCOL SOLUBLE CUTTING OIL

Here's another case that illustrates the faster production and increased tool life being achieved with Tycol cutting oils in metal plants throughout industry:

This major manufacturer of marine valves had experienced trouble and slow-downs in threading stainless steel. Although using a highly recommended cutting oil, his die head speed was down to 30 RPM – chasers required regrinding after every 30 to 40 pieces.

Then he switched to Tycol 665 Soluble Oil—mixed 1 part oil to 25 water—and immediately threading speed increased 190%, and tools produced as much as 300 pieces between grinds. On threading of monel metal and naval bronze, this manufacturer also improved production with Tycol Cutting Oil.

Many similar cases in our files bear out the demonstrated superiority of Tycol cutting oils for all types of machining operations. There is a complete line of Tycol cutting oils and lubricants engineered for every industrial use. A Tide Water engineer will be glad to recommend the one best suited to your requirements. Call or write your nearest Tide Water office for complete details.

Gasoline Powers the Attack— Don't Waste a Drop!

TYCOL Soluble Cutting Oil

DRUMS! DRUMS! DRUMS!
War needs make it extremely important that all empty drums be returned immediately.

INDUSTRIAL TYCOL OILS-GREASES

TIDE WATER ASSOCIATED OIL COMPANY

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Eastern Division: 17 Battery Place, New York 4, N. Y.

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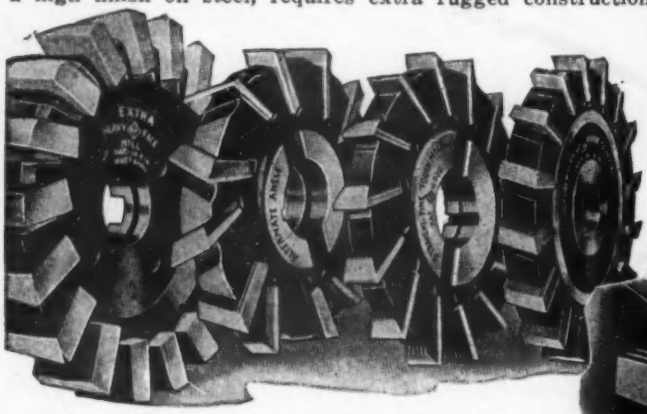
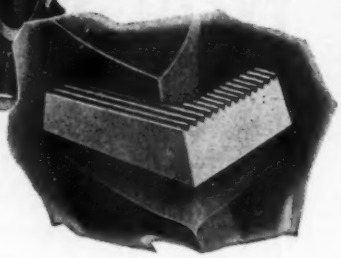
NEGATIVE RAKE AND SPIRAL MILLING CUTTERS
FOR MACHINING STEEL AT HIGH SPEEDS

The O K Tool Co. not only originated Inserted-Blade Milling Cutters but also pioneered the successful adaptation of these cutters to negative rake and spiral milling.

This type of milling, a "shearing" cut from rear to point of blade which leaves a high finish on steel, requires extra rugged construction both in cutter and set - up. Extreme strength and rigidity are outstanding characteristics of O K Inserted-Blade Milling Cutters, due to the very high grade material and to the effective locking mechanisms employed.





In O K Milling Cutters, the blades are separate cutting units; the bodies are of drop-forged steel. The blades are held securely in mating serrations —always easy to adjust or renew. No pins, no set-screws, no wedges. Made in a wide variety of styles and sizes for all types of metal cutting machines.

THE O K SYSTEM
OF INSERTED-BLADE METAL CUTTING TOOLS

O K Tools Are Available for Every Metal Cutting Need

THE O K TOOL CO., SHELTON, CONN.

WHEN COLLET WORK IS INDICATED - SPECIFY

Precision Collets

For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

IMMEDIATE DELIVERY FROM STOCK

The *Precision* name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify *Precision* when ordering from your dealer. Literature on request.

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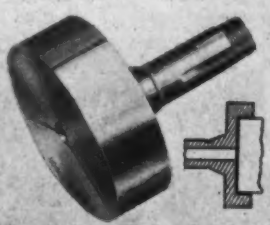
- MODEL 3C: For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- MODEL 1A: For 8" & 9" South Bend.
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Scheuer, Sebastian, etc.
- MODEL 4C: For 14½" South Bend, ¾" capacity Sheldon, Hardinge No. 4, Elgin, etc.
- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.

KLUTCH - KOLLET (Step Chuck) for chucking work to 2¾" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, 1A adapters only. List unbored $7.50 each.



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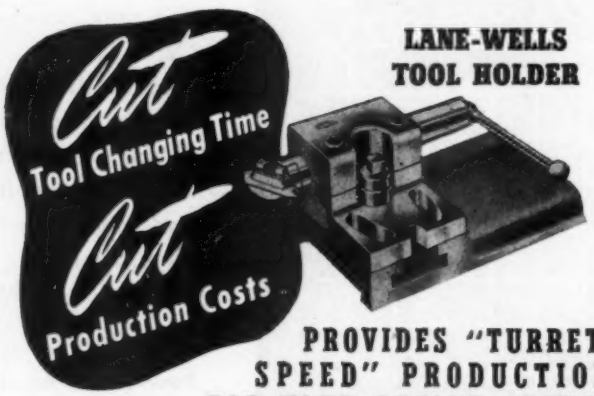

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Instant Changes for
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FACING

TURNING

Send for Bulletin

Give your engine lathe the speed, accuracy and precision of a modern turret lathe by equipping it with a Lane-Wells Tool Holder. Production operations proceed at turret lathe speed because "tool-changing" time is reduced to less than five seconds.

A quarter turn of the control lever unlocks, or locks the quick detachable head in position for the next operation. Experience proves that production time is cut as much as ⅓ on quantities of identical operations.

Four sizes fit all standard lathes from 9" to 36" swing.

LANE-WELLS COMPANY
Engineers and Manufacturers
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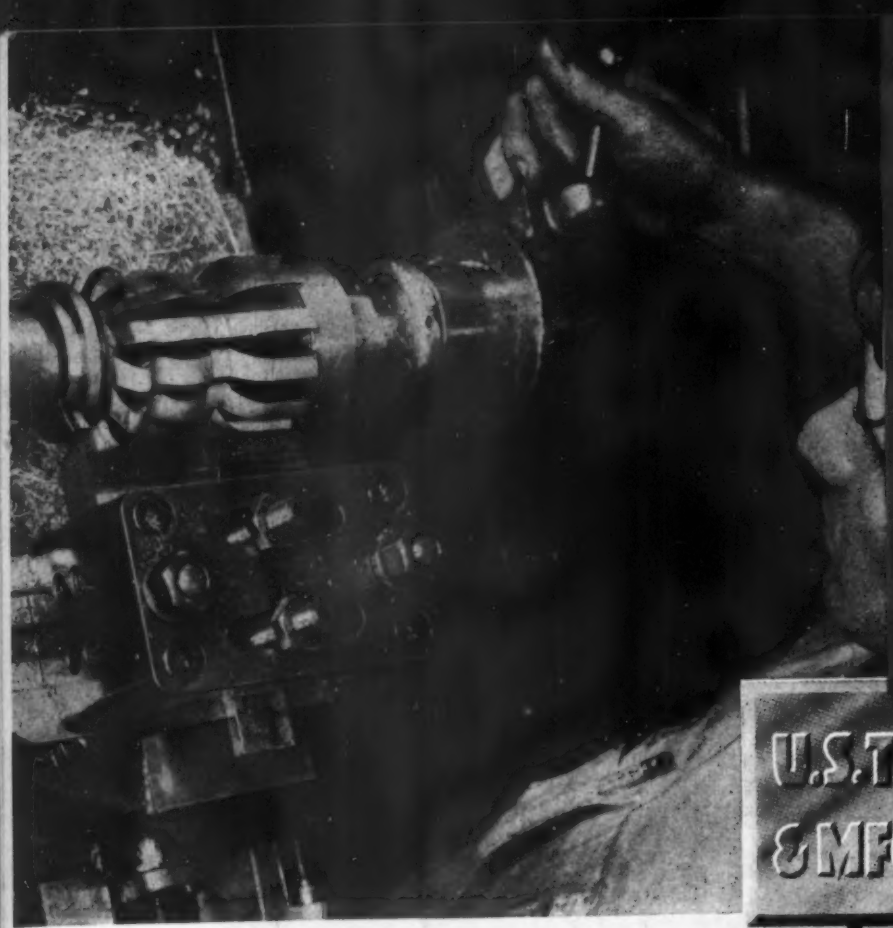

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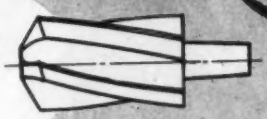
MIDWEST Core Drills

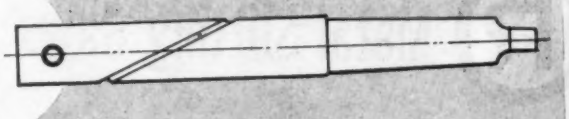
FOR ENLARGING DRILLED, PUNCHED FORGED OR CORED HOLES

HIGH SPEED DRILL TIP
STYLE NO. 410
Sizes: ⅝" to 3"



PLAIN CORE DRILL HOLDER
STYLE NO. 1410
Recommended for relatively shallow work with drill tips ⅝" to 1 15/32" dia.

PILOT BEARING CORE DRILL HOLDER
STYLE NO. 1415
Designed for operation through jig bushings with drill tips 1" to 1 15/32" dia.



FLUTED CORE DRILL HOLDER
STYLE NO. 1420
Recommended for deep hole work with drill tips 1½" to 3" dia.

MIDWEST DRILL TIPS are made from selected high speed steel; Midwest Holders are made from tough alloy steel. This combination of Tip and Holder saves vital steel by taking the place of solid high speed core drills which are costly and often quickly go undersize. Midwest Tips can be ground many times before replacement is necessary and when worn out a new one can be inserted in the original holder without removing the holder from the machine.

These core drills and holders are provided with the rigid and accurate Midwest Taper and Pin Drive, and the combined Tip and Holder has all the advantages of a solid steel drill.

Midwest Core Drills are furnished to fit plain, piloted type or fluted type holders as illustrated above. Further information on Midwest Core Drills and other Precision Metal Cutting Tools is contained in Midwest Catalog 17.

SAVES VITAL HIGH SPEED STEEL

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Engineers and Manufacturers of Precision Metal Cutting Tools which contribute to the progress, prosperity and comfort of mankind

MILLING CUTTERS • SLEEVES • COUNTER BORES • END MILLS • REAMERS • SPECIAL TOOLS • FORM TOOLS CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

ANOTHER EXAMPLE OF *JOB TESTED* MIDWEST TAPER AND PIN DRIVE

Ⓡ Metal Slitting Saws

Majority of Sizes Available for Immediate Delivery!

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Side Chip Saw

Staggered Teeth Saw

Slitting a surface grinder front spindle bearing (shown above) is only one of countless operations performed by these Circle R saws.

The Circle R side cut slitting saw is designed to take deep cuts, split chips and eliminate dragging while the Circle R Slitting Saw, with staggered teeth, is for use where deep cuts or heavier feeds are required. The shearing action of the peripheral teeth and more chip clearance on the sides give this latter saw an advantage over the regular side chip clearance.

For complete details and specifications on these and other Circular Saws, send for Catalog K.

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LOS ANGELES · ROCHESTER · INDIANAPOLIS · DETROIT · ST LOUIS

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EXTRA LONG LIFE

In addition to standard morse taper sizes (1 to 7, inclusive) carried in stock . . .

Precision-built MOTOR TOOL LIVE CENTERS are constantly being developed by our engineering staff for numerous SPECIAL machining operations. Spindles, heads, tapers and points are designed to exactly fit the work to be done.

Whatever your needs—standard or SPECIAL—consult with our engineers. Know the speedier production and greater economy of using MOTOR TOOL LIVE CENTERS—the centers that will not burn out or break down-no matter how long or how tough the job.

LOCK FOR REDRESSING POINT WITHOUT DISMANTLING.
NEEDLE BEARING FOR TRUE RUNNING AND PREVENTION OF CHATTER.
CORK THRUST PAD COMPENSATOR FOR HEAT AND EXPANSION OF WORK.
HEAVY DUTY BALL BEARING FOR GREATER THRUST LOAD.
HEAVY DUTY ROLLER BEARING FOR GREATER RADIAL LOAD CAPACITY.
GREASE SEAL TO RETAIN LUBRICANT AND KEEP OUT FOREIGN MATTER.
LARGE SPINDLE FOR STURDINESS AND GREATER LOAD
BULL NOSE MALE HEAD
BULL NOSE FEMALE HEAD

MOTOR TOOL MANUFACTURING CO.

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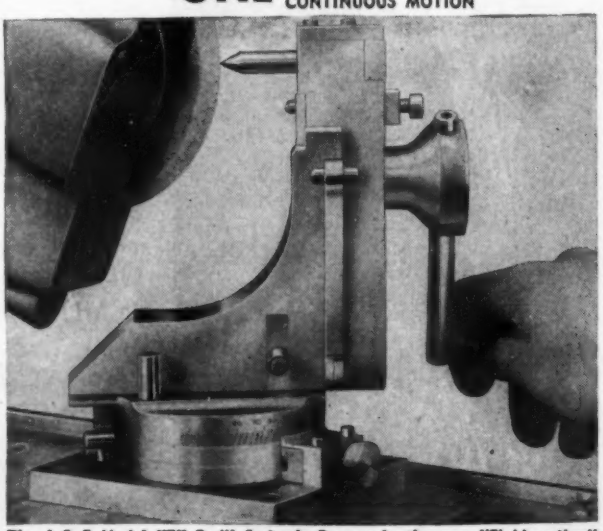
USE

Fluid-motion

for modern form-dressing

ONE SETTING
HANDLE
CONTINUOUS MOTION



The J & S Model "E" Radii & Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

FEATURES

Fluid-motion dressing.
.0001" accuracy.
Automatic centering.
Chatterless and dustproof.
14" wheel capacity.
Versatile and adaptable.

J. & S. TOOL CO.

477 MAIN STREET
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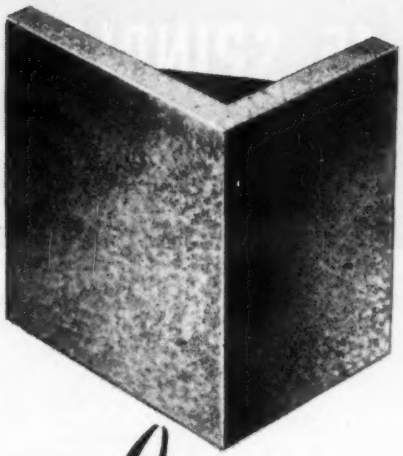

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LOMBARD ANGLE PLATES

Rigidly supervised control of production gives you inspection equipment of unequalled precision within three tolerance ratings. Made from semi-steel type iron, close-grained and of high quality, they provide satisfactory service in three price ranges.

Long life accuracy and resistance to machining stress are assured through Lombard's special heavy ribbing, scientific heat treating and accurate finishing.

3 FINISHES AVAILABLE

Machine Finish — an Excellent Commercial Finish
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SURFACE PLATES RECONDITIONED

Careful scraping of worn surface plates puts them back into perfect condition for added years of service. Prompt service assured.

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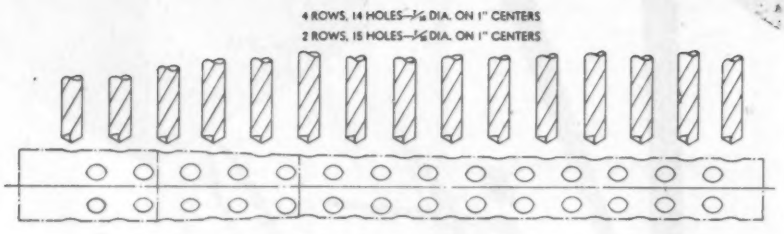
ASHLAND · MASSACHUSETTS

15 SPINDLE HOEFER UNIT

Drills Seamless Steel Tubing BARREL JACKET

A fifteen-spindle head, guide bushing plate and side indexing fixture with six station indexing work holder, drilling eighty-eight 7/16-inch holes, 1-inch centers in air cooled jacket of machine gun.

As production increases so do savings with Hoefer Multiple Spindle Heads. These units will more than repay your investment in the quality of work produced and in uninterrupted service that contributes so greatly to lower cost operation. Our many years of experience in manufacturing Multiple Spindle Heads qualifies us to take over your problem and solve it for you. No matter what your job is we can furnish the head to meet your production need. Add a Hoefer Head to your present machine and turn it into High-Production Money-Saving Equipment.



Job requires 4 rows, 14 holes—7/16" diameter on 1" Centers and 2 rows, 15 holes, 7/16" diameter on 1" Centers. Drill turns 70' per minute with .007" per revolution feed or 4.277" penetration per minute. Travel, drilling depth including tip of drill, ¼". Drilling time per row 3½ seconds.

Hoefer's Whole Business is Holes . . . . **HOEFER MFG. CO.** *Freeport, Ill.*

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

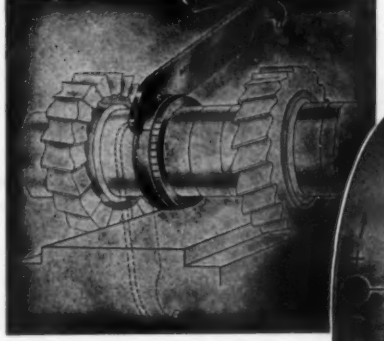
NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

FAST, ACCURATE SPACING

for
SIDE MILLING CUTTERS
GANG MILLING SET-UPS

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

are made in 12 standard sizes for cutter arbors from ⅞" through 2"—other sizes on request.



You have plus or minus .0005" at your finger tips with Dayton Rogers Adjustable Spacing Collars. Graduated in thousands, you can make an accurate and positive adjustment by simply loosening the cutter arbor nut and making necessary corrections as illustrated above.

Try them once and you will never run a gang or multiple milling job without them. Write today for full particulars.

DAYTON ROGERS MFG. CO. Minneapolis, Minn.

You'll Get *Better Performance* Dividends From Your Investment In SAFCO Cutting Oils and Coolants

Safco #556 Eliminates Staining of Copper-Alloy Parts

A New England manufacturer of screw machine products recently consulted a Swan-Finch Service Engineer in an effort to improve cutting oil performance on both steel and non-ferrous metals. After investigation of machining methods and plant conditions, SAFCO #556 was recommended.

Definitely improved finish was reported after using SAFCO #556—and tool life was increased appreciably. Staining of copper-alloy parts was eliminated—advantages which totaled up to very satisfactory performance.

Longer Tool Life—Smoother Finish With Transrex #1

An eastern manufacturer, producing a machined part which required drilling and reaming NE 8620 steel, tested SAFCO Transrex #1 Soluble Oil at the suggestion of a Swan-Finch Service Engineer who had surveyed the operations.

Improved results were immediate. The company reported that, after a thorough and prolonged test, they had found that Transrex #1 provided longer tool life and a smoother finish than any other soluble oil they had used on this operation.

Eighty years of experience in the formulation of specialized oils is only one of the factors which protect your investment in SAFCO Cutting Oils and Coolants. This experience provides the assurance that SAFCO Oils are *right*—and the careful and detailed training of Swan-Finch Service Engineers enables them to specify exactly the right oil for your needs.

Here's our offer to you. Merely ask a Swan-Finch Service Engineer to recommend a cutting oil or coolant for any operation in your plant, however difficult it may be. Test the oil he recommends—judge the results for yourself. If you do not get *proveably* better performance *we'll cancel your invoice for the test drum!*

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By driving studs the "MODERN" power way, slow, laborious and costly hand methods are eliminated, and great savings in time, labor and money are assured.

MODERN STUD SETTERS in the Packard Plant contribute to the overall production efficiency in turning out Rolls Royce Engines. Packard is using the same method in setting studs in aircraft engines as the automobile manufacturers have used for many years.

●

Write for detailed information on the MODERN Stud Setter. You'll be interested in how and why it provides a proved means of stepping up production.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

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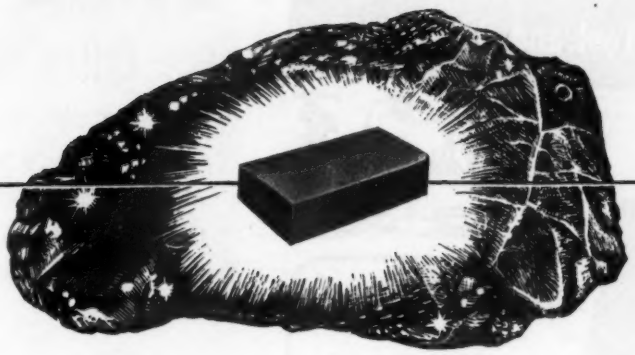

QUALITY CONTROL

FROM ORE TO FINISHED PRODUCT

Shop superintendents throughout America's metal-working plants can tell you that steel-cutting time is saved and superior results are obtained by Vascoloy-Ramet Carbide Tools.

"Vascoloy-Ramet" was the *first* successful cemented Carbide developed for machining steel. It has been painstakingly maintained as the *number-one quality* by *complete control* of processing Tantalum-Tungsten Carbides from the crude ore to the finished product.

Vascoloy-Ramet Corporation and Fansteel Metallurgical Corporation (world's foremost producers of Tantalum) work hand in hand, to maintain the quality of the world's finest Carbide. Advanced methods of manufacture have now lowered the cost to the user!

Tools are now supplied in two finishes, Unground and Finish Ground. Unground Tools have all the angles and clearances formed and are very practical for shops having the equipment to grind their own tools. Unground Tools offer a substantial saving in cost. Finish Ground Tools are ready for use and are the finest quality tools known to industry.

WRITE FOR PRICE LIST 280A

If you are not getting maximum machining efficiency in minimum cutting time, try Vascoloy-Ramet Tantalum-Tungsten Carbide Tools.

VASCOLOY Ramet RAMET CORPORATION

VASCOLOY-RAMET CARBIDE TOOLS AND TANTUNG CAST ALLOY CUTTING TOOLS

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Widely used by many companies and trade schools throughout the U. S., it meets urgent need for a complete, up-to-date text for training new men, "refreshing" older men, or trouble-shooting in the tool room. The shortage of tool and die makers must be met fast by men who know the "whys" and "hows." This book gives them both and more. It shows how to select tool steel; how to make tools; how to avoid trouble; how to improve tool performance.

TOOL STEEL SIMPLIFIED

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Vice-President of
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315 pages — 205 illustrations
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FOR QUICK CHANGE MARKING

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- Guaranteed for years of service.
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Most Modern • Light Weight • Perfect Balance • Hollow Steel Frame • Triple Plated Chrome Finish

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Engineered To Perfection
A New Standard of Accuracy

TUBULAR MICROMETER CO.
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trace THIS FIGHTER'S RECORD BY HIS MEDALS!

"Captain Dag"

If there were decorations for industrial heroes, Mr. Dag would be a much be-ribboned gentleman. Perhaps we should call him 'Captain' Dag, because he commands so versatile a company of physical and chemical properties.

Captain Dag (a campaigner who will never be mustered out) represents Dag brand colloidal graphite, the smooth, black liquid concentrate which serves so many different war industries. Capt. Dag may take the form of a dry film, a fluid film, a surface coating, an impregnation, etc.

PHYSICAL AND CHEMICAL PROPERTIES

1. Slippery—A Good Lubricant. Softer than Talc
2. Conducts Electricity
3. Withstands Temperature Extremes
4. Absorbs, Radiates and Conducts Heat
5. Maximum Purity
6. Low Coefficient of Expansion
7. Particles Bear Like Electric Charges
8. Insoluble in Acids and Alkalies
9. Black and Opaque
10. Gas Adsorbent
11. Little Photoelectric Effect
12. Miscible with Most Fluids
13. Films Adhere Tenaciously and Dry with Sharp Edges
14. Microscopically Fine Particles. Penetrates Fine Pores
15. An Excellent Suspension

1 3 8 14 13 6

1, 3, 8, 14, 13, 6

CITATION: "We have been enthusiastic users of Dag colloidal graphite for more than ten years. We find it the only material which will prevent bolts, nuts and flanges from seizing under the high temperature and pressure conditions in our boilers and steam systems."

1 3 13 14

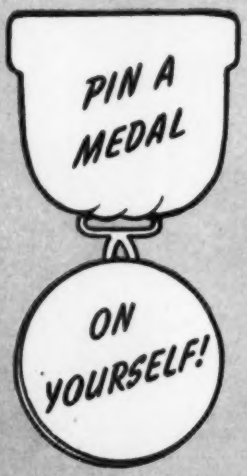
1, 3, 13, 14

CITATION: "Dry films formed from Dag colloidal graphite supply durable lubrication on parts which could not be effectively lubricated otherwise. Such films are functioning at temperatures from (—60° F. to +1200° F.) and higher."

2 4 13 10 11 3

2, 4, 13, 10, 11, 3

CITATION: "Graphite films when applied to the grids (and frequently the plates) of radio tubes for receiving and transmitting, are useful for minimizing secondary emission, 'back' emission and photoelectric effects."



For easy reference we've given colors to Captain Dag's most valuable properties. Match these colors with the performance "citations" above. Then pin a medal on yourself for putting Captain Dag to work in your plant. He's one campaigner who won't be mustered out.

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dag COLLOIDAL PRODUCTS

ACHESON COLLOIDS CORPORATION

PORT HURON, MICHIGAN

SHEFFIELD

DIAL INDICATOR SNAP GAGE

FOR INSPECTION AND CLASSIFICATION

1 Gage may be used with dial either at the bottom or the top, whichever is more convenient.

2 Dial is adjustable radially and can be swung through 360° to facilitate reading.

3 Scale has a range of .005"—each graduation .0001".

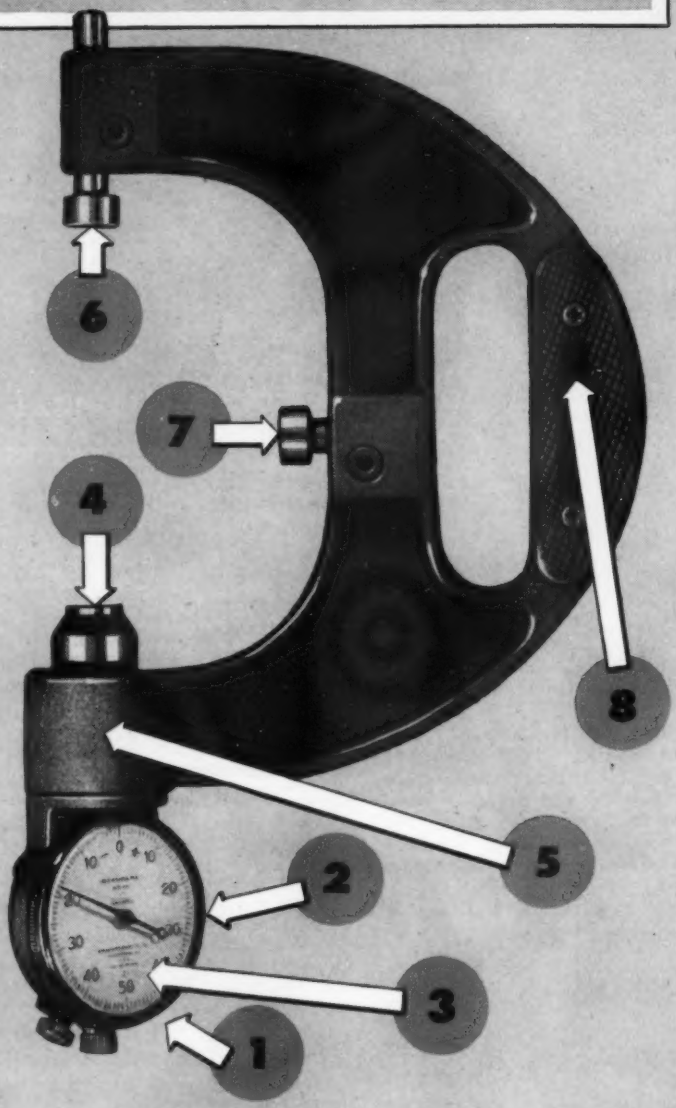
4 Movable anvil is spring urged for constant gaging pressure, but spring has no effect on indicator. Special spring pressures available.

5 Movable anvil bearing is long enough to preserve alignment with the fixed anvil.

6 Fixed anvil is adjustable to a maximum of one inch.

7 Adjustable backstop has a cylindrical face for accurate line contact.

8 Comfortable handle with plastic grip to insulate gage from heat of inspector's hand.



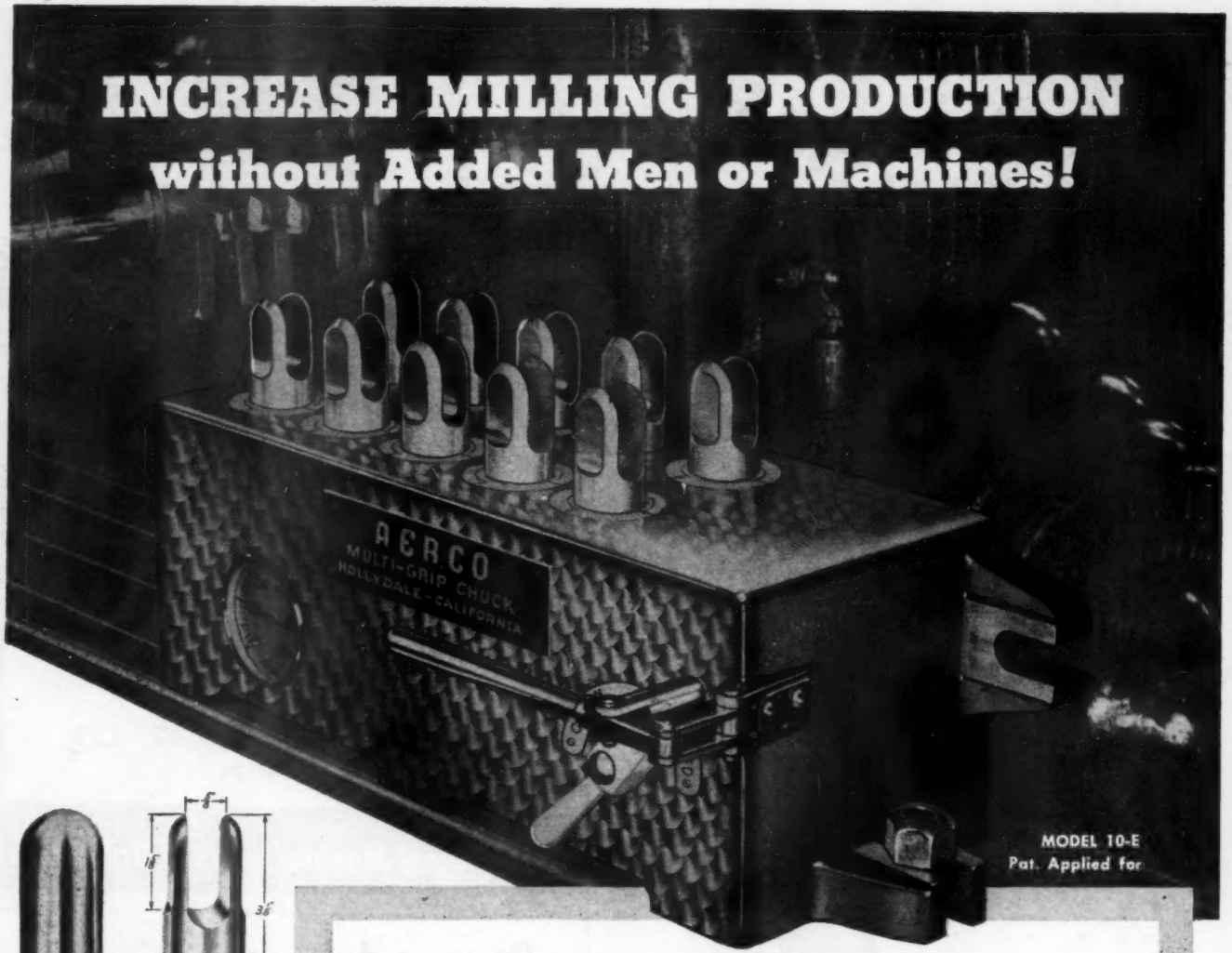
Work may be gaged to the accuracy of a one "tenth" indicator without removing it from the machine.

THE SHEFFIELD CORPORATION

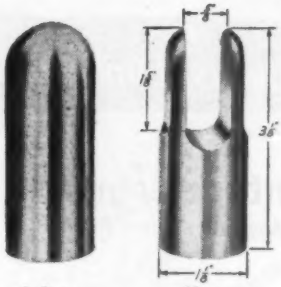
Dayton 1, Ohio, U.S.A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

INCREASE MILLING PRODUCTION
without Added Men or Machines!



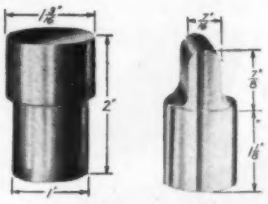
MODEL 10-E
Pat. Applied for



Before *After*

Aluminum Parts

These aluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before *After*

Chrome Steel Parts

These parts, high heat treated of Chrome-moly, were produced at the rate of 62 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

These parts milled with the use of the Aerco Multi-Grip Chuck show its versatility.

with the AERCO HYDRAULIC MULTI-GRIP CHUCK

Two rows of collets hold ten parts and both rows are milled simultaneously and with but a single loading increasing production as much as 500%.

Self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations. Safety stop prevents damage to collets should all stations not be loaded.

Aerco Multi-Grip chucks may be used for both vertical and horizontal milling. Work is held rigidly in collets and cannot turn or be pulled out during milling operation, however clamping pressure is instantly releasable and self-opening collets can be quickly re-loaded.

Collet sizes range from ⅛" to 1¼" and are available in round, square or hexagon shapes.

Representatives Wanted in Principal Cities

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AERCO CORP.

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Selected for SERVICE

Speed your output with Criterion Diamond Tools. The kind of service they give is responsible for the swift, steady increase in their use. Quality of diamonds employed plus a unique method of setting assure extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Ask your dealer or order direct. Request free literature.

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MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

Almond Drill Chuck

The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field — the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes *to fit all machine tools and portable drills.*

Write for complete details

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U. S. A.

The Original Manufacturers of Drill Chucks

Distinct Advantages for You

—with Permanent Magnet Type Chucks

No Wires...
No Heating...
No Operating Costs...

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For sale only in the United States of America and its Territories and in Canada.

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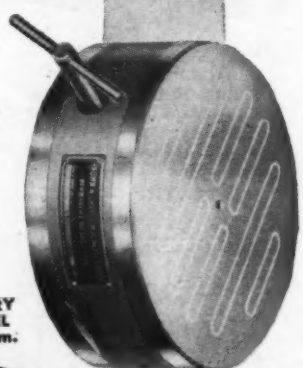
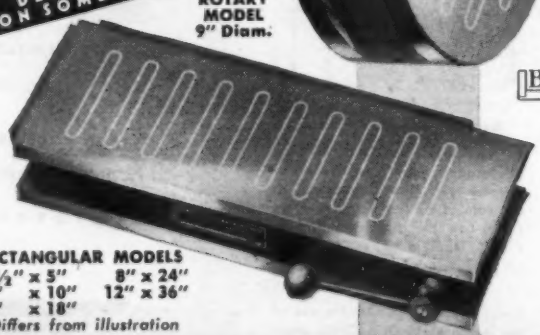


ROTARY MODEL 9" Diam.

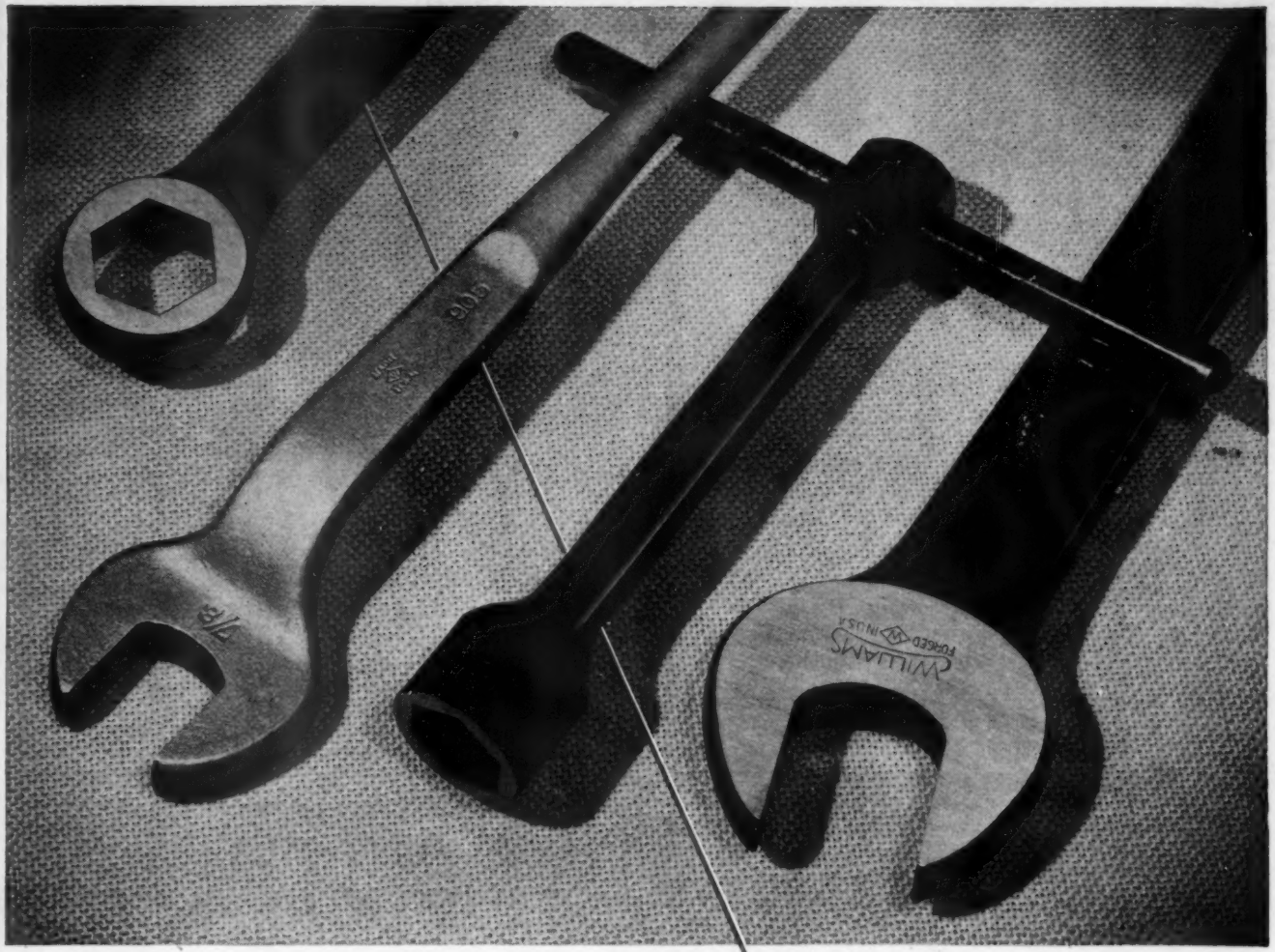


RECTANGULAR MODELS

*2½" x 5"	8" x 24"
5" x 10"	12" x 36"
6" x 18"	

*Differs from illustration

BROWN & SHARPE
MAGNETIC CHUCKS
PERMANENT MAGNET TYPE



To Win the War... To Keep the Peace

TOOLS by the tens of thousands are needed now to take the battle to our enemies. After Victory more thousands will be needed to arm the workers... to build automobiles, radios, refrigerators... all those needed things for which record demand is fast accumulating.

Our first job at Williams is war production. But we are eager for that happy tomorrow when we can again give industry new and better tools with which to build... to keep the peace... to seal the Victory!
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DROP-FORGINGS AND DROP-FORGED TOOLS

Use GOLCONDA - the DIAMOND TOOL in the *forged setting*

Outstanding in the maximum efficiency it offers, the forged setting provides *all* the qualifications necessary to obtain the utmost value from the diamond. Your investigation will reveal its importance to your production.

Faithfulness to standards of quality and craftsmanship gives Golconda Diamond Tools utmost reliability and superiority. In performance, they meet industry's exacting demands for speed and efficiency.

Golconda supplies "the *right* tool the *first* time," based on experience of more than 20 years. Here are precision and high quality production tools for all truing and dressing operations.

Write for our free booklet NO. 21

It contains valuable facts concerning the important types of diamonds, their uses and settings; and—of special importance—our free Survey Service. Through specific written recommendations this Service assists you to maintain maximum operating efficiency from your tools.

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DIAMOND PRODUCTS CORP.
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Boyar - Schultz

NO. 1 PROFILE GRINDER

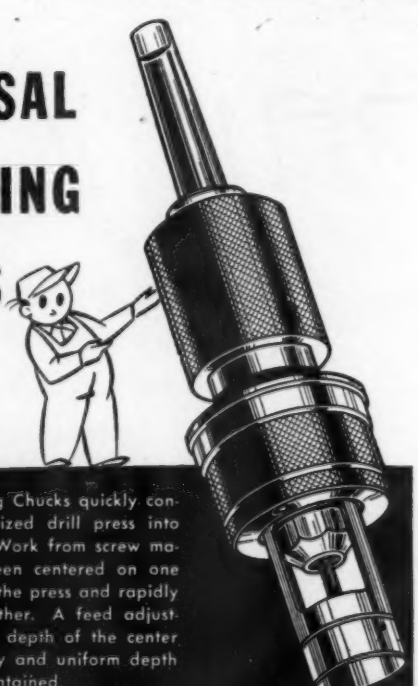
New Streamlined Design . . . . . New Square Table

Replaces slow hand work in grinding and fitting irregular shapes and difficult contours in tool and die work. ¶ High speed assures fast stock removal, even with small wheels. ¶ Vertical oscillations given even wheel wear. ¶ New square table with serrated top permits smooth movement of work and easy grinding to close tolerances. ¶ New streamlined design for extra ruggedness. ¶ Bench model . . . portable.

Write for New Circular

BOYAR SCHULTZ CORPORATION
2109 Walnut Street **CHICAGO 12, Illinois**

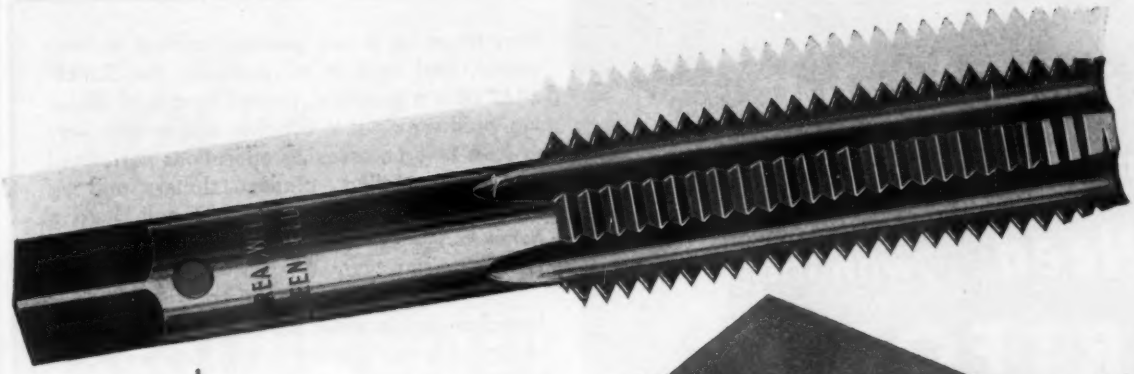
UNIVERSAL CENTERING CHUCKS



Universal Centering Chucks quickly convert any medium-sized drill press into a centering tool. Work from screw machines that has been centered on one end can be set on the press and rapidly centered on the other. A feed adjustment regulates the depth of the center so that concentricity and uniform depth of centers are maintained.

A convenient arrangement is provided for quickly removing the center drill and guide bushings. Write for further facts.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN



YOU CAN TELL IT'S A *Threadwell*

1. by color *i-dot-ification* — a quick, sure, easy way to identify the right tap for the job. Only a *Threadwell* carries the color dot.
2. by the *tap-capsule* — every *Threadwell* Ground Thread Tap in its individual transparent plastic tube—sealed against dirt and damage—identified for size and type without unwrapping.
3. by its *greaselessness*—always shining clean and dry, yet securely shielded against rust by a new and improved process.
4. by its *performance* — every *Threadwell* tap lives up to its name. It *threads well* and accurately and repeatedly long after ordinary taps are worn out or broken. Its smooth, *polished flutes* prevent the chip clogging and breakage you get with many taps not so carefully finished.
5. by the *Threadwell distributor* and his superior service. He gets from us and he gives to you *personal attention* to every tap order. That is a fundamental and invariable *Threadwell* business principle.

RED for high speed cut thread

WHITE for commercial ground thread

BLUE for precision ground thread

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SINCE 1902
"TAPS OF DISTINCTION"

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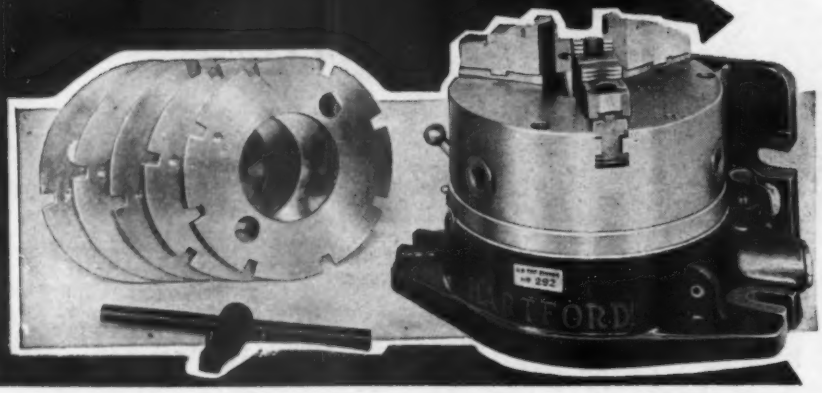
Get that higher Production Capacity You Need . . . with the HARTFORD SUPER-SPACER

Easy to set up in any position, vertical or horizontal, and rigid in *all* positions, the SUPER-SPACER is a practical, proved means of speeding production. It is a quick, inexpensive way to save time on indexing operations performed on millers, drillers, planers, slotters and jig borers. It is economical even on small lots and hence a money saver in the tool room or on the production line.

Interchangeable mask plates prevent any possibility of error; graduations in degrees on the circumference make it easy to attain odd spacings.

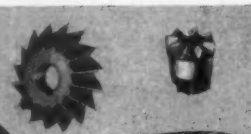
Attachments are available for both plain and radial drilling.

Write for fully descriptive bulletin showing the SUPER-SPACER applied to a wide variety of unusual jobs.



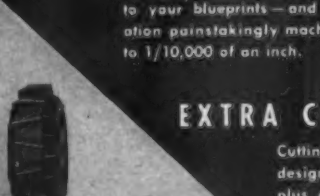
The HARTFORD SPECIAL MACHINERY CO.
Hartford, Connecticut

WHAT DO YOU NEED IN SPECIAL CUTTING TOOLS?



ACCURACY?

Every order is carefully work-planned to your blueprints—and each operation painstakingly machined—even to 1/10,000 of an inch.



EXTRA CUTTING LIFE?

Cutting teeth or flutes scientifically designed for longest cutting life—plus correct scientific heat treating—give added useful life.

FAST DELIVERY?

Long experience, special facilities and "Know How" permit semi-production speed—even on specials.

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We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

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What do you know about WELDING STAINLESS STEEL?

Successful welding of Stainless Steel depends on (1) the type and characteristics of the steel to be welded, (2) the suitability of the electrodes used, and (3) *the skill and knowledge of the welder.*

The first two factors are constant because the production of stainless steel, today, has reached a high state of perfection and . . . *there is a type of* McKAY STAINLESS STEEL WELDING ELECTRODE, *with exactly correct characteristics,* for every stainless welding need.

The skill and knowledge of the welder, therefore, is of paramount importance! The more technical "know how" you have, the better.

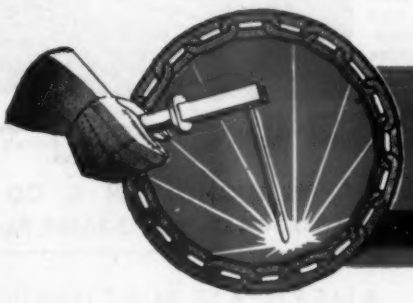
Can you answer the questions, listed at the right, correctly . . . and give the reasons for your answers? These and similar questions are discussed in a booklet soon to be released by the McKAY COMPANY. It will contain, as well, other data useful to every welder. It's *free.* Reserve your copy today by writing for *"Things to Know About Welding Stainless Steel."*

DO YOU KNOW THE ANSWERS?

Test your knowledge with these 3 brain teasers. Then check the accuracy of your opinion by referring to the correct answers below. Space does not permit publication of the "reasons why" but full explanation may be found in the forthcoming McKAY booklet, "Things to Know About Welding Stainless Steel." Reserve your copy now . . . and watch for additional questions and answers in subsequent ads.

	TRUE	FALSE
1. *All Stainless Electrodes regardless of their manufacturing source or analyses, are coated with one or the other of two fundamental types of coating.*	☐	☐
2. *Compared with ordinary steels, Stainless Steels of the Chrome-Nickel type conduct heat about one-half as rapidly and expand twice as much.*	☐	☐
3. *Proper annealing practice for Chrome-Nickel Steels requires holding at 1900°F. for one hour for every inch of thickness; then furnace cool.*	☐	☐

Answers: (1.) True (2.) True (3.) False



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THE McKAY COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS

A PRECISION TOOL

Accepted as Standard

BY LEADING MACHINE SHOPS

IDEAL
LIVE CENTERS

4 Interchangeable Inserts for all kinds of centered and uncentered work.

IDEAL's precision-built Live Centers permit heavier loads, and deeper cuts at higher speeds because they rotate with the work. Exclusive with Ideal are the four interchangeable inserts. Centers with Morse tapers carried in stock.

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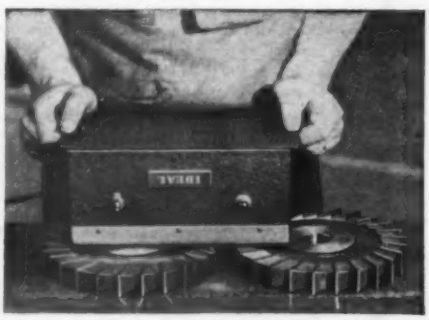
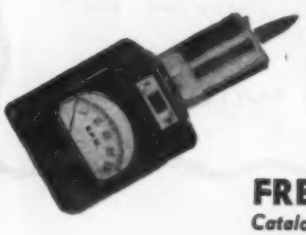
A single pass across the demagnetizer removes metallic dust, flakes, fine chips, etc., clinging to the cutting edges of your tools and dies.



IDEAL ELECTRIC TACHOMETER



Checks RPM instantly. Used as a "Hand Type" or with generator separated from meter as "Separable Type". Two Ranges —0 to 2500 RPM and 0 to 5000 RPM.

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- LEVER TYPE for continuous production. Feather pressure releases work while lathe is running. LIST $79.50, Collet extra.
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SAVE TIME with NICHOLSON

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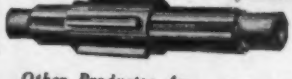
You also PROMOTE PRECISION when you equip your shop with these economy tools for holding work while being machined. Hardened tool steel; precision ground.



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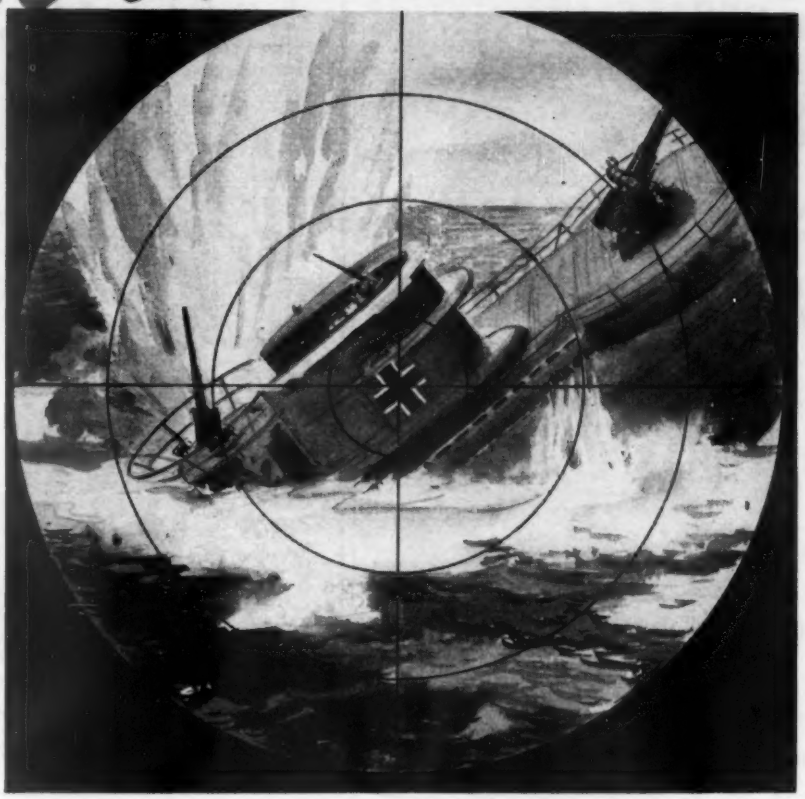
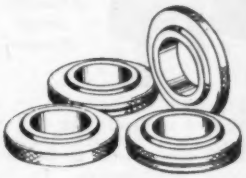
IT'S "GO" OR "NO GO"





And ⊗ Marks the Spot.

Trained accuracy and split-second timing enable a navy gunner to score a "bull's-eye. So "X" marks the spot where another enemy U-boat goes down. Such feats, all important steps in the winning of the war, are possible because the thousands of small parts that make up our weapons are fitted to work smoothly and flawlessly.

Manufacturing to exact tolerances won't permit even a small degree of guesswork. Eliminating faulty parts and helping to build dependable equipment is the important job Kobe Master and Reference gages are doing today. Without these high-accuracy gages the inspector's "GO" or "NO GO" would be worthless, America's industrial leadership impossible.

Every Kobe gage is a precision-engineered instrument built to standards many times finer than those used in the finest of watchmaking. Nothing has been left undone to insure uniform quality. Research has developed the best materials for each type of gage Special treating processes and methods of successful chromium plating were found. Kobe's own manufacturing technique now includes special testing equipment and master gaging which makes that extra degree of exactness possible. It is this constant attention to minute detail that results in gage perfection.

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KOBE, INCORPORATED
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SOLID ADJUSTABLE DIE HEADS

with Insert Chasers

for **BROWN & SHARPE** *Automatics*

Made in five sizes for B & S automatic screw machines, numbers 00, 0 and 2. A new alignment feature takes care of variation in alignment between turret and spindle. The holder is now made an integral part of the head. These Heads use the famous low cost H & G High Speed Insert Chasers. Good deliveries on high priorities.

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● *Contains detailed information and specifications you will need.*

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MANUFACTURERS OF H & G DIE HEADS SINCE 1914

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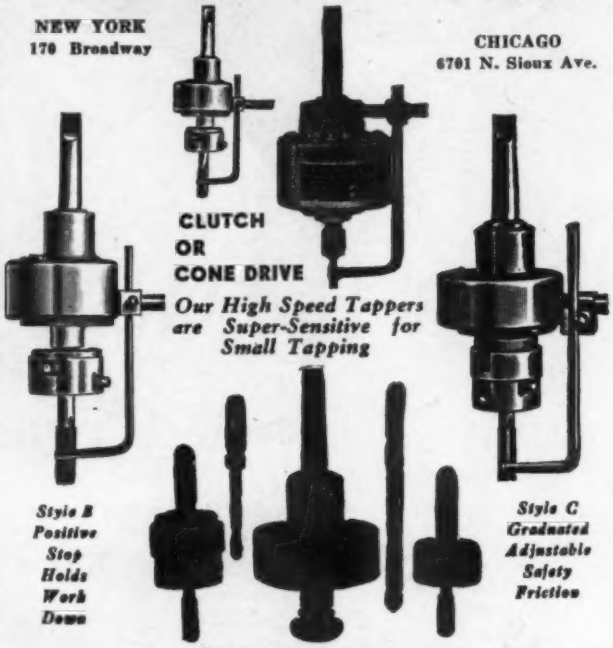

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Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down

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DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

"ROCKWELL" HARDNESS TESTER

These new improved type testers available from stock.

Made Only By

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A Gage with Locking Cams which will stay set

Good Delivery

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Cum laude

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It is here that the Industrial Furnace Engineer makes use of advanced knowledge of ★mechanical engineering in the designing of new furnace mechanisms—★ceramic engineering in the utilization of better furnace refractories—★electrical engineering as applied to temperature controls and operating mechanisms—★chemical engineering in the combustion and chemistry of gases—★metallurgical engineering as applied to heat treatment—★combustion engineering for the proper application of fuels to heating problems—★production engineering in fitting the furnace into the production line—★cost engineering that will minimize operating costs—★design engineering—★development engineering—★practical engineering—★sales engineering, and most important ★*Results Engineering*. It is here that men of industry with particular manufacturing problems come to draw upon great accumulations of engineering data and knowledge, that only time and experience have been able to develop.

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The Heat Treater's Helping Hand

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Standard and Special Industrial Furnace Equipment For:
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Build Your Present and

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PNEUMATIC EQUIPMENT

FLAT TOP WORK HOLDER

AIR PRESSES

AIR CLAMPS

PNEUMATIC WORK FEEDERS

COLLET FIXTURES

MIDGET AIR CLAMPS

Because...

1. It will save more than its cost in **mechanical movements.**
2. It will save more than its cost in **increased production.**
3. It will save more than its cost in the **construction of jigs and fixtures.**
4. It will improve morale by **reducing muscular fatigue.**
5. It will **increase your plant capacity** without additional floor space.

To speed war work—to get a running start into faster, more economical post-war production—investigate Mead Pneumatic Equipment now!

NEW CATALOG READY

Send for copy of our new Air Power Catalog illustrating, describing many new man-and-money-saving devices.

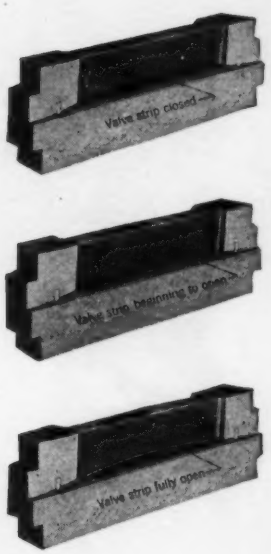
MEAD AIR OPERATED DEVICES *save precious man-hours!*

MEAD SPECIALTIES COMPANY

15 SO. MARKET STREET

DEPT. 64-MA • CHICAGO 6, U. S. A.

NEW WORTHINGTON HUSKIE PACKAGED COMPRESSORS



The simplest, lightest, most efficient compressor valve ever made. A thin strip of steel seats by increasing contact from each end to the center. No springs, buffer plates or cushioning devices. Fits accurately even when valve seat is warped, and patented end inserts prevent pinching.

For Cooler Running . . . Trouble-Free Operation

Here's a lot of long-lived power, from 400 to 1350 cu. ft. per minute displacement, in a new streamlined "package" specially designed for trouble-free operation, low installation and maintenance costs.

In both 3 and 5-step models, variable capacity control results in the *cooler operation* of Worthington's new Y Angle Type Huskie Compressors. Cylinders are open to cool suction air at most stages of unloading.

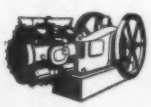
Other Worthington "Outperformance" features include Feather Valves*— forced feed lubrication — filters for uninterrupted oil filtration, non-stop filter-cleaning. Write for more details. Describe your application.

WORTHINGTON PUMP AND MACHINERY CORPORATION
HARRISON, N. J.

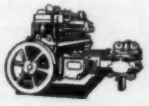
WORTH BEHIND THE NAME WORTHINGTON

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON HUSKIE

Y Type . . . Horizontal . . . Vertical . . . Radial



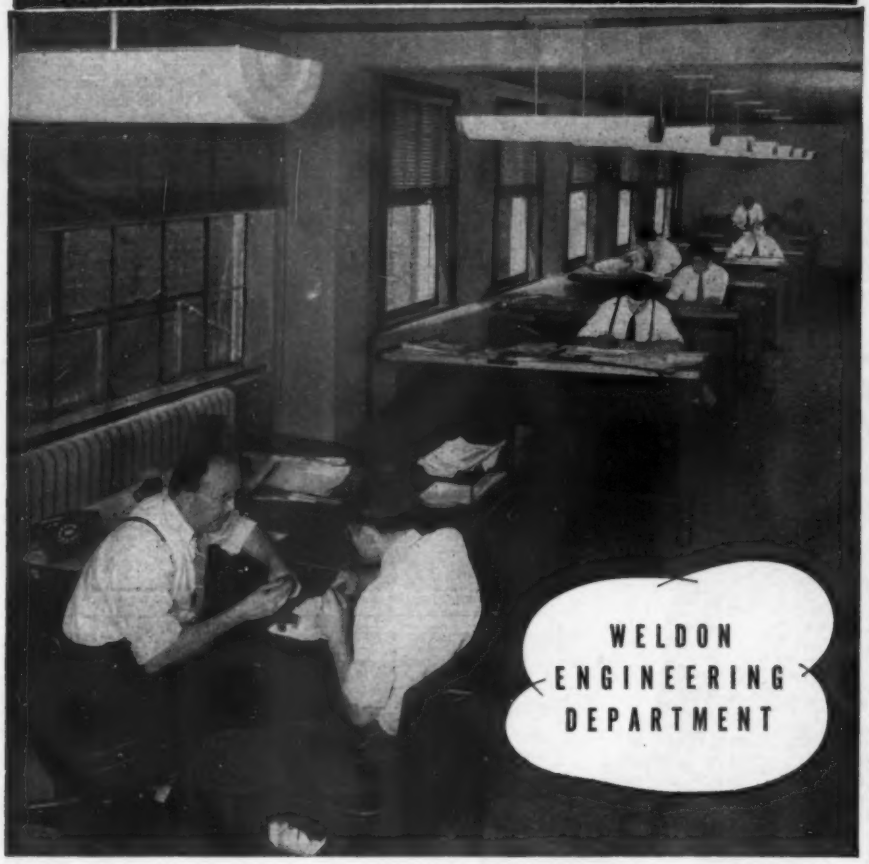
Portable . . . Gas Engine Compressors . . . Vacuum Pumps



*Reg. U. S. Pat. Off.

AC-1-B

YESTERDAY'S PIONEER • • • TODAY'S LEADER



TELL US YOUR NEEDS

We'll Supply the Cutting Tools —from Stock or Special

Don't worry about the particular types of cutting tools you need nor how to make them—*that's our business.*

Just tell us what you want them for—the kind of jobs they have to perform. We'll design and make the tools to order—or supply them from our comprehensive stock. Over 25 years experience and complete equipment are at your disposal.

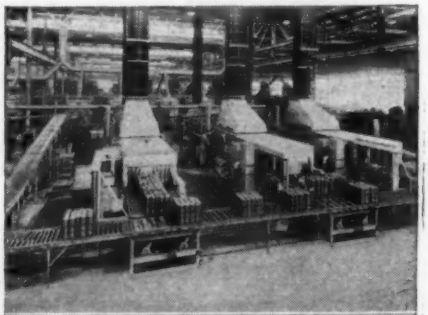
We can make immediate shipment of most sizes of WELDON End Mills. Write for stock list.

THE WELDON TOOL CO. *Cleveland 4, Ohio*

3000 WOODHILL ROAD

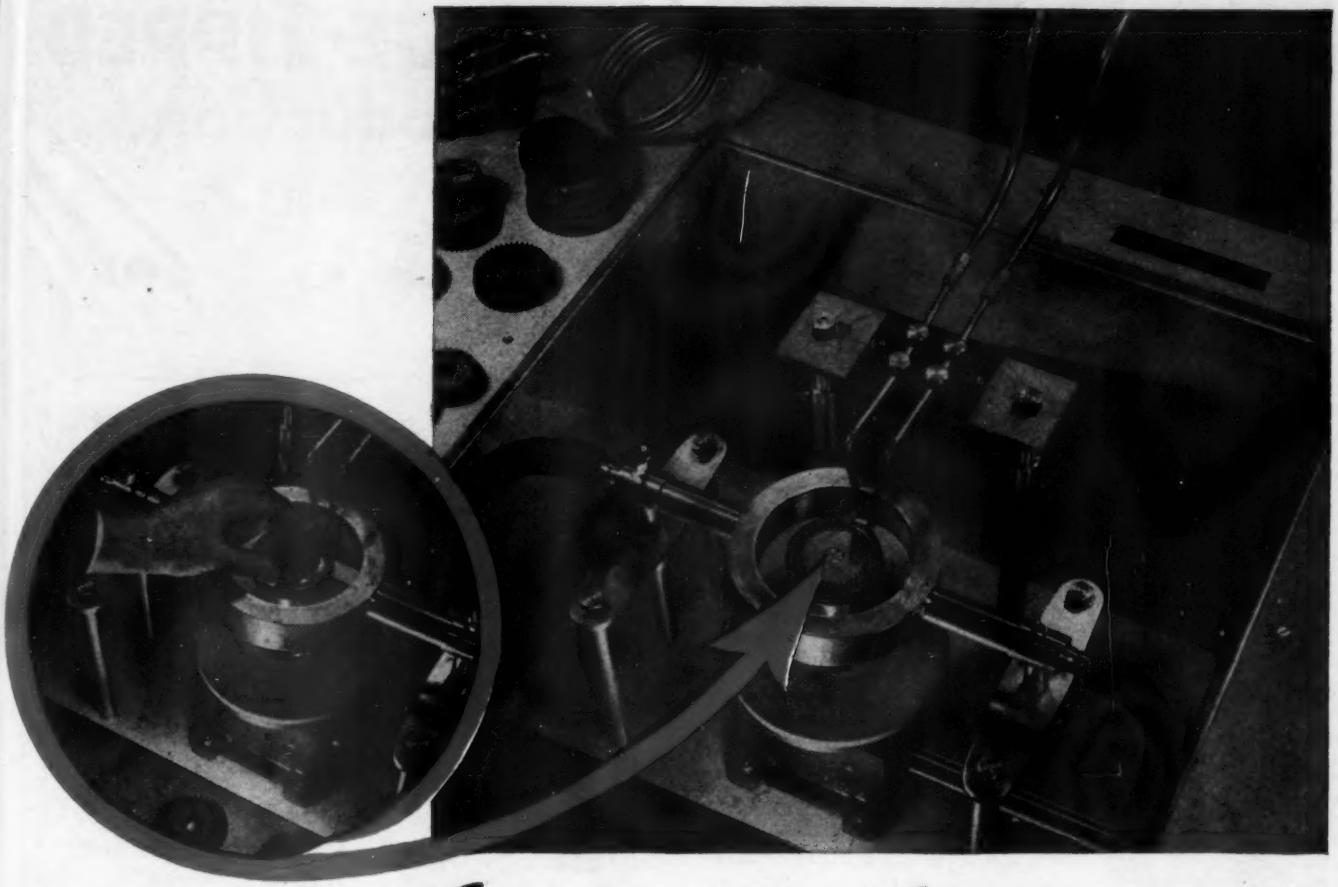
As Manpower Problems grow more acute!

As war production reaches its peak, the manpower situation in industry changes. In most cases the problems are becoming more acute. The demands for men and women for the Armed Forces are heavy. The only recourse, if production is to be maintained, is the use of more women or older men, whenever possible. More than ever, Mathews Engineering is essential. Mathews Gravity and Power Conveyers, and the special devices which make Mathews Systems prominent, are on the job in the great war plants of the United States and Canada, helping to move materials through manufacturing departments, with greater control, lower cost, and with a minimum of fatiguing effort on the part of machine operators. They are serving these men and women — helping them to do a better job without unnecessary re-handling of heavy materials. Mathews Engineering service is available in principal cities of the United States and Canada.



Mathews Conveyer Company

ELLWOOD CITY, PENNSYLVANIA



ANOTHER *Outstanding Improvement* In Gear Hardening

Lepel High Frequency Induction Heating Units are made in various sizes. The same unit can be used for hardening, brazing, soldering, melting, etc., of both ferrous and non-ferrous metals. Easily converted to peacetime use at no cost. Write for catalog.

THE hardening of gears and pinions, long recognized as an ideal application of high frequency induction heating, is a field in which Lepel has pioneered and developed many noteworthy improvements. It made possible localized hardening, practically eliminating warpage and retaining the toughness and ductility of untreated areas. It produced superior wearing qualities, provided greater uniformity and cut hardening time to a matter of seconds.

Now Lepel offers another outstanding improvement in the hardening of gears and other round-section parts. The new Lepel roto-heating and quenching unit causes the part to revolve at a predetermined speed within the load coil during the automatically-controlled heating and quenching cycles. The result is a degree of uniformity never hitherto achieved by any hardening process — a new high standard of quality for such parts.

The unit, including motor drive, load coils and quench rings, is comparatively inexpensive and can be operated in connection with any standard Lepel Induction Heating Unit.

A Lepel representative will be pleased to call upon you upon request. Or Lepel engineers will harden samples of your parts to your specifications and furnish complete data without obligation.

Lepel

LEPEL HIGH FREQUENCY LABORATORIES, INC.

Pioneers in Induction Heating

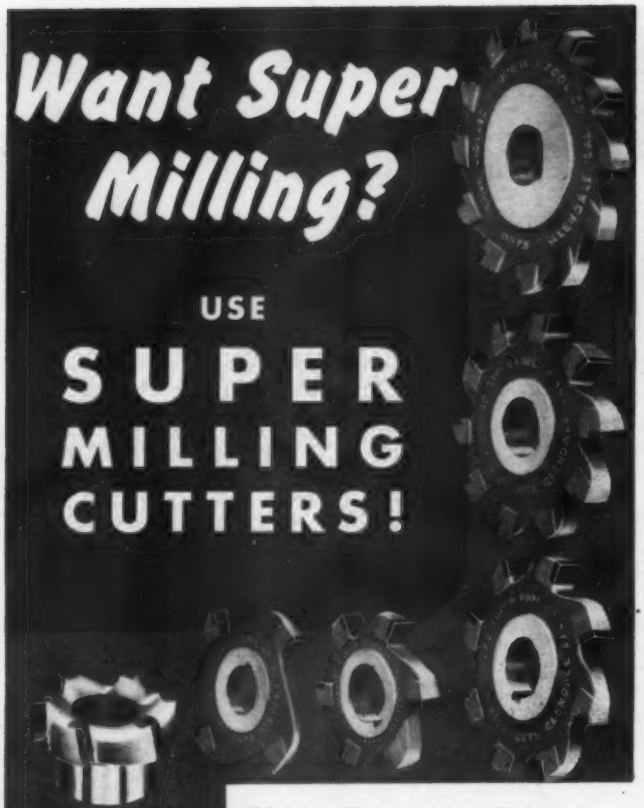
39 WEST 60th STREET **NEW YORK 23, N. Y.**

HIGH FREQUENCY INDUCTION HEATING UNITS

Want Super Milling?

USE

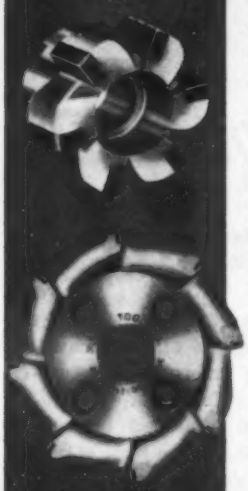
SUPER MILLING CUTTERS!



Plain milling—side milling—face milling—end milling—whatever the types of milling operation you are doing, try a Super Carbide-Tipped Milling Cutter . . . and see what we mean by Super Performance! For in the Super Tool Line you'll find a milling cutter for any of the above types of milling operation—one that will bring faster cutting, cleaner cutting, finer finishes, greater accuracy and longer cutter life to that milling job.

Super Carbide-Tipped Milling Cutters are made in the complete range of standard sizes. That's another reason why they are MONEY SAVERS! Super Tool Milling Cutter Economy starts with the first cost and continues on through every operation in the cutter's long life.

Try Super Carbide-Tipped Milling Cutters TODAY, and you'll agree . . . For Super Milling use Super Milling Cutters!



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Carbide Tipped Tools

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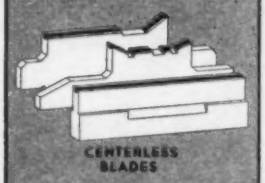

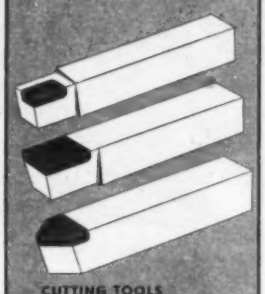

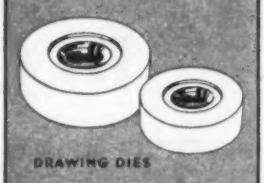

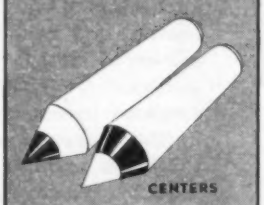

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. . . is a superior grade of Tungsten Carbide—developed by us during the past twelve years and manufactured today by precision methods under rigid control. It has exceptional density, strength and hardness and is ideal for application at wear points on tools, machinery and equipment. Talide Metal bar stock is available in any size, diameter and length.

The use of Talide Metal in your plant will assure you of constant, uninterrupted production with the added advantages of . . .

★ Longer Life
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Thousands of Talide-Tipped Tools, Dies and Wear Resistant Parts are shipped daily all over the country to Arsenals and War Plants producing cartridge cases, small arms ammunition, primer cups, airplanes, tanks, ships, rifles, machine guns and other war material.

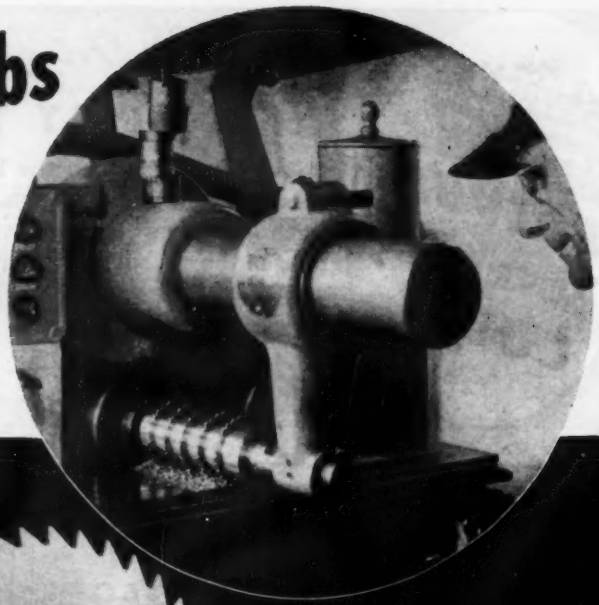
TIPPED WITH TALIDE TUNGSTEN CARBIDE

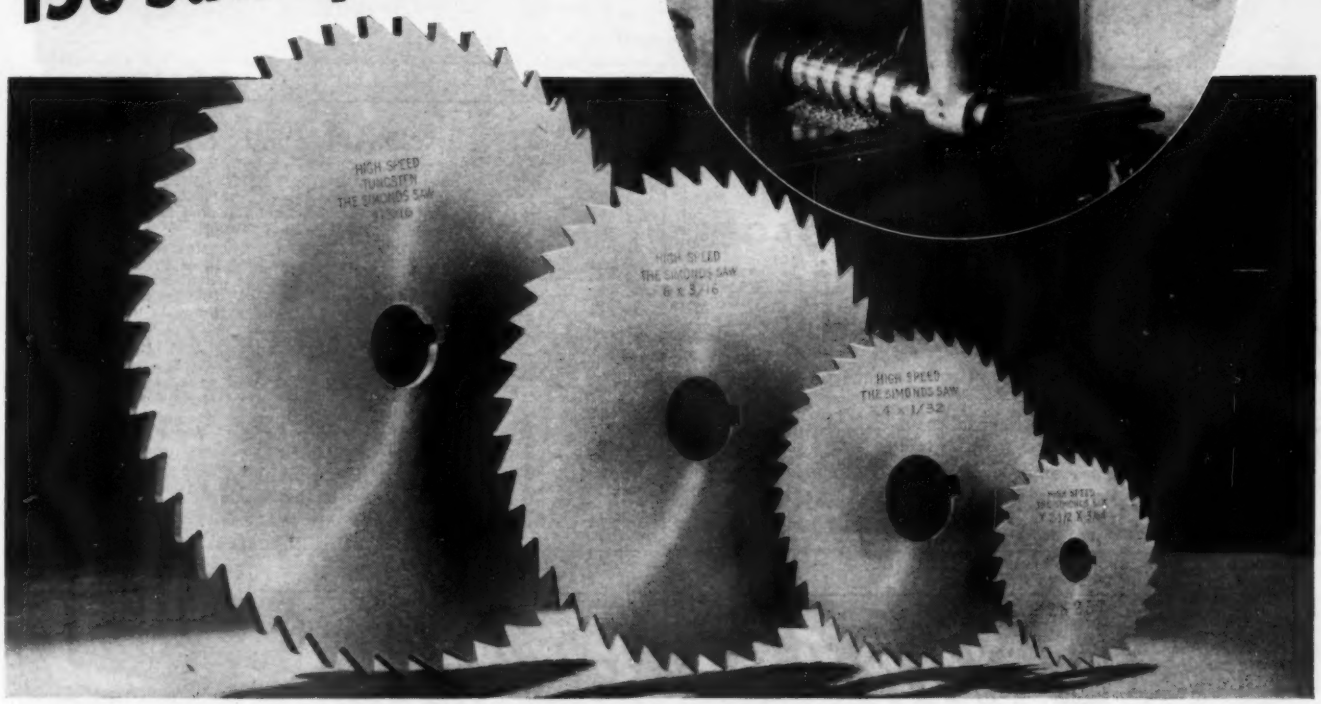
METAL CARBIDES CORPORATION

YOUNGSTOWN, 5 OHIO

TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

For Gang-Milling Jobs up to 150 Saws per Set-up





...USE SIMONDS METAL-SLITTING SAWS

On jobs like this — slitting high-carbon steel sheets from 1/16" to 1/4" thick — Simonds Metal-Slitting Saws cut with smoothness and accuracy that eliminate extra operations often needed. And in addition to metal-slitting, the high-speed steel saws are used in many other applications using up to 150 saws in the set-up.

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PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

SIMONDS
SAW AND STEEL COMPANY
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Stuart's Thred Kut Solvol "Super-Kool" Codol

Begin with the finest cutting Fluids...

THEN APPLY THEM PROPERLY . . .

● Anything less than the best cutting fluids available is a handicap to your production. Equally important is *proper application.* Stuart Oil Products and Stuart Oil Engineering will give all the advantages it is possible to get from cutting fluids.

For All Cutting Fluid Problems

D. A. STUART OIL CO.

Chicago, U. S. A. • LIMITED • Est. 1865

Warehouses in Principal Metal Working Centers

EDDY SERVICE GAGES STYLE 22

A NEW IDEA IN GAGES ALL SIZES IN ONE GAGE

May be set in tool room for each job, go to job with job ticket, return to tool room and re-set for other jobs.

Each gage in case with complete set of rods to gage all sizes within frame limits.

Gage and 8 rods in case to gage from 0" to ¾" $18.00
Gage and 12 rods in case to gage from 0" to 1" 22.00

Larger sizes and many other styles. Price on Application.

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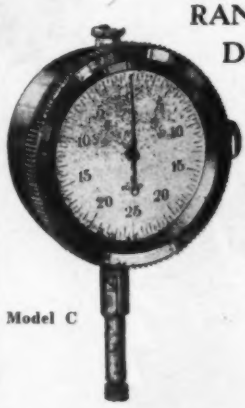

Model C

RANDALL and STICKNEY Dial Gauges and Indicators

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2⅛ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .005 in. or .01 mm. Has a ½-in. range, movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for catalog describing our complete line.

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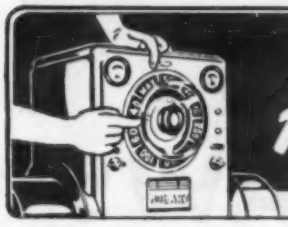
Waltham, Mass., U. S. A.

Makers of Dial Gauges Since 1885



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HOBART BROTHERS CO., Box A.M. 6-22 TROY, OHIO *"One of the World's Largest Builders of Arc Welders"*

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STEVENS MILLING MACHINE VISES

5 in., 6 in. and 7 in. sizes

All parts Interchangeable

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HOLMAN BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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ANNOUNCING A NEW LINE! Precision DRILL JIG BUSHINGS

Behind this line are the special skills and experience derived from the successful manufacture of "Precision" Collets and lathe attachments. . . . On a production basis for the first time, "Precision" Drill Jig Bushings have been made widely on special order for two years.

Immediate delivery from stock on all important sizes. Write us for catalog.

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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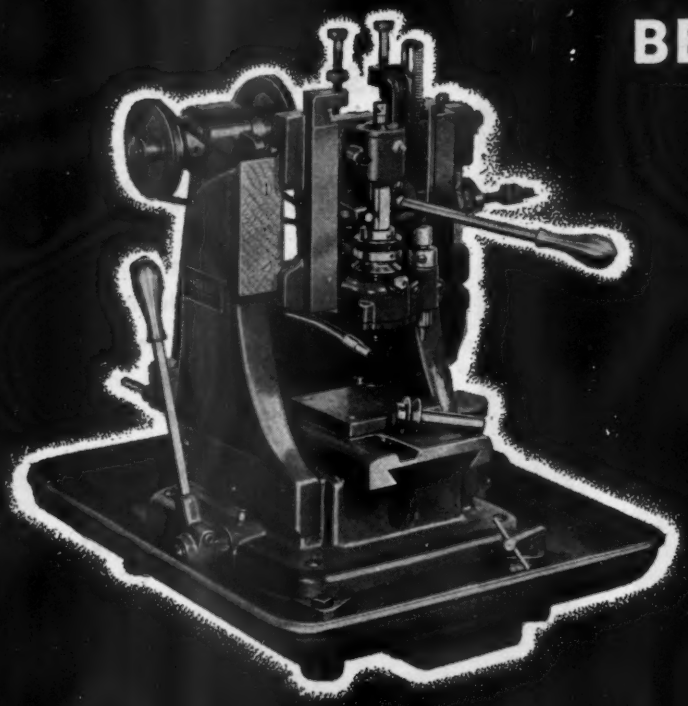
Right in the Lead

THE GEOMETRIC TOOL CO.

NEW HAVEN 15, CONN.

You Can Do a Wide Range of Work With This Wade MOTOR DRIVEN BENCH PROFILER



FOR SMALL PROFILING, MILLING, SLOTTING, RECESSING AND ROUTING OPERATIONS

SPECIFICATIONS

Working area:
2" x 4" horizontal, 1¼" vertical
Fixture block: 4" x 4" x ½"
Work surface of table: 4¼" x 4"
Travel of vertical slide: 1¼"
Travel of table: 4½"
Travel of cross slide: 2"
Cutting tool collet: Any standard size up to 5/16" dia. Standard ¼" collet supplied unless otherwise specified.
Distance of table to nose of spindle, when down: 2¾"
Center distance, cutter spindle to follower: Approx. 2-1/16"
Follower cutter spindle: No. 2 B&S taper
Motor: Standard ¼ h.p., 3-phase
Speeds: Four speeds ranging from 1000 to 8000 RPM
Dimensions: 19" wide, 24" long, 22" high.
Weight: Net, 260 lbs., boxed, 285 lbs.

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

You can do a wide range of precision work with this Wade Motor Driven Bench Profiler . . . work such as profiling, milling, slotting, recessing and routing operations . . . on a variety of small parts such as watch and clock plates, clock mechanisms, mechanical time fuses, parts for small firearms, range finder parts, typewriter and adding machine parts, etc.

It is a precision built profiler for production work. Women and unskilled help can quickly become expert in its operation and turn out duplicate precision work within exceedingly close tolerances.

The Wade Bench Profiler is a time and money saver . . . a small, moderately priced machine tool that will pay for itself over and over in your production line.

Write today for catalog

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

Counteract BACK and SIDE WEAR

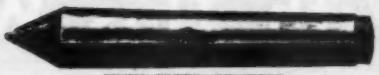
with improved MILFORD PROFILE SAW . . .

It is a fact that most contour and profile saws fail on the back and the sides before the hardened cutting edge wears. Not so, MILFORD PROFILE SAW!

This is but one of the many accomplishments of MILFORD metallurgy.

SERVICE? One of the large manufacturers of airplanes needed some PROFILE SAW in a hurry. They telephoned us . . . "Could we ship 8 miles of PROFILE SAW at once?" That was only a little over 42,000 feet, and we shipped it from stock that very day. True, we couldn't duplicate that every day, but our stocks are large and complete, and shipments are prompt.

THE HENRY G. THOMPSON & SON CO.
Saw Specialists Exclusively for Over 65 Years
NEW HAVEN, CONNECTICUT, U. S. A.



HIGH SPEED CENTERS

FASTER SPEEDS *and* LONGER LIFE

between grinds on lathes and grinders equipped with RED-E High Speed Steel centers because they have high speed steel ends. All tapers and sizes. *Write for Bulletin.*

The READY TOOL CO.
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TORNADO WRITING TOOLS and ETCHERS

TORNADO Electric Writing Tool. Used for marking everything. Easily portable anywhere.

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TORNADO Electric Writing Tools and Etchers mark everything of value that might be lost, misplaced or stolen. TORNADO Writing Tool marks brass, marble, tile, glass, plastics, wood, hard rubber, aluminum, steel and bronze.

TORNADO Electric Etcher marks iron, steel and steel alloy products. Burns permanent identification on various types of tools, dies, gauges, plates, gears, etc. Protects your valuable tools and other portable equipment!

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WAR BONDS
are
WAR WEAPONS

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Invest to the limit!

--The Patented Collet assures the Precision of the

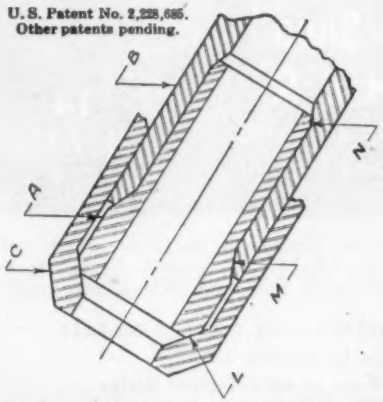
ERICKSON Precision COLLET CHUCK

Collapses 1/32 in.—Retains Gripping Strength and Accuracy.

Model "01" accurate within .0005 or less at the nose. **Model "02" accurate within .001 or less at the nose.**

Collet open at both ends.

U. S. Patent No. 2,228,685. Other patents pending.



PRINCIPLE

The drawing (left) illustrates the revolutionary principles embodied in the Erickson Precision Collet Chuck.

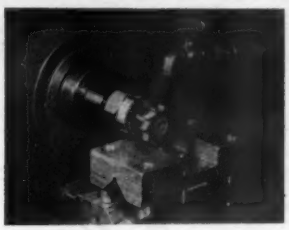
Collet "A" is automatically lined up concentrically with the axis of the Shank "B" by two Cam Surfaces of the Collet "M and N" mating with the Cam Surfaces of Shank. The Shank and Collet Cam Surfaces are mated to within .0001 inch.

This action aligns Collet with the Axis at the Center of Shank, allowing it to be drawn back by Collet Cam Surface "L" and Nose Piece "C".

Due to the fact that collet is open slotted at both ends, Collet "A" then collapses equally throughout its length to maintain a vise-like grip and remain in perfect alignment with the Axis of Shank.

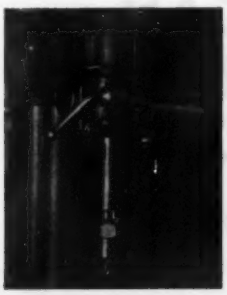
Tool Post Grinder equipped with Model 301 Chuck.

One ERICKSON COLLET will replace 7 standard, single purpose Collets.



Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.

Model 102 Chucks for drilling and tapping operations on Turret Lathe. Jobbers Drill stubbed on chuck in foreground.

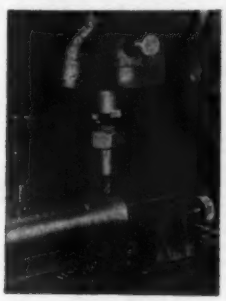


Model 201 used in drill press. Extra long drills can be used, by extending them from the chuck as they wear.

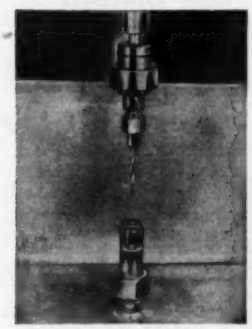
Model 402 Chuck in use on Automatic Screw Machine. Drill gripped on flutes.

Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.

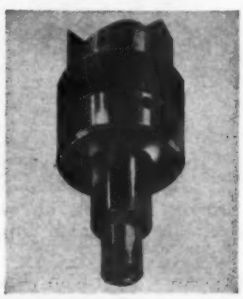
Special Model 202 Chuck used in Hand Drills in Aircraft Industry. 01 Models are regularly recommended for Hand and Air Drills.



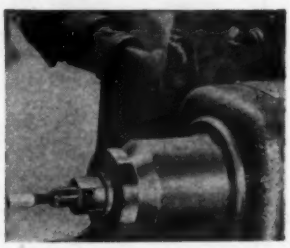
Vertical Milling operation with 101 Chuck.



Model 301 Chuck adapted to quick change production operation on upper spingle. Note self-contained, interchangeable drill bushings in special nose piece on lower chuck.



Model 201 High Speed Router Chuck with extend nose piece for pattern following.



Model 301 Chuck designed for high speed internal grinding operations.

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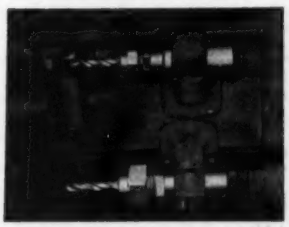
Model 102 Chuck—adapted for standard floating holder operations.



Models 102 and 402 Chucks in use on Automatic Screw Machine.

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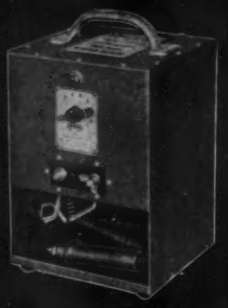

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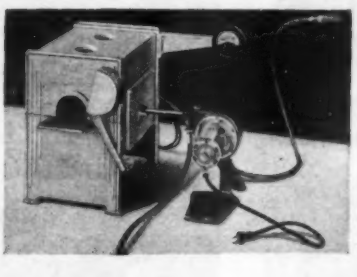

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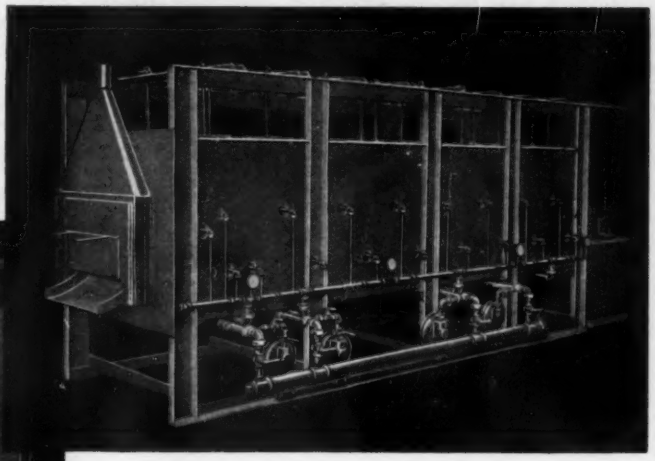

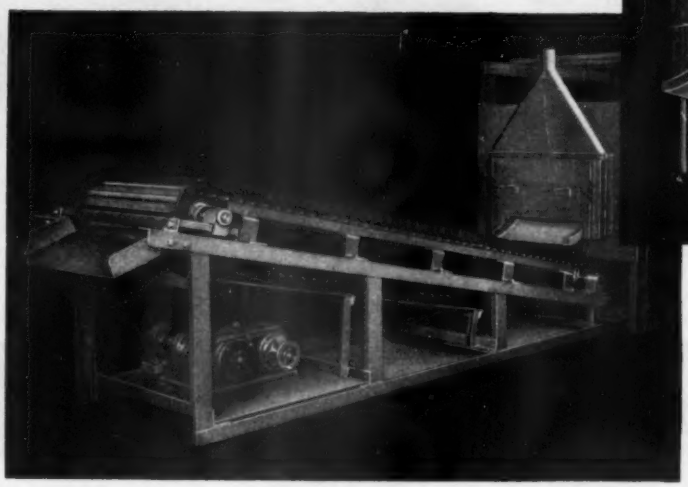

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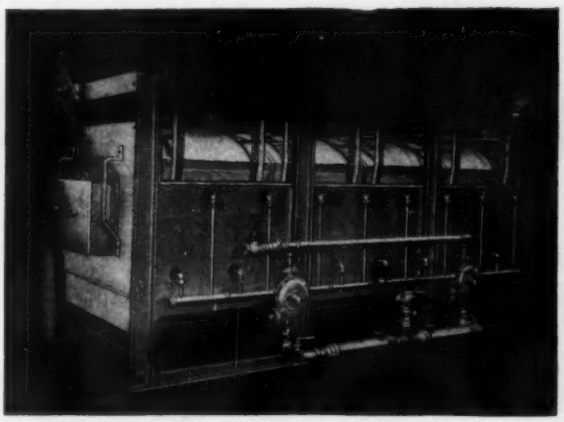

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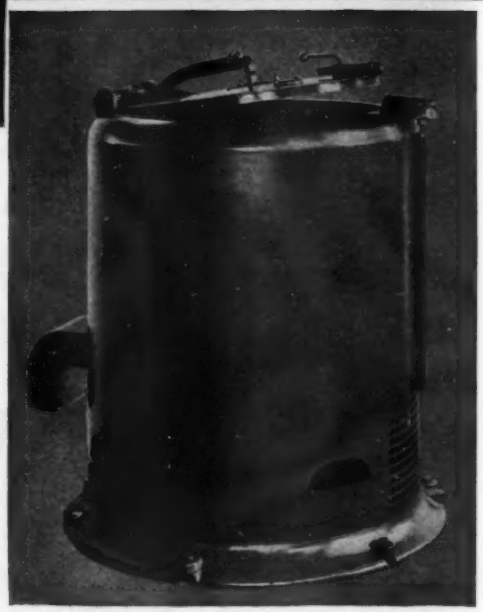

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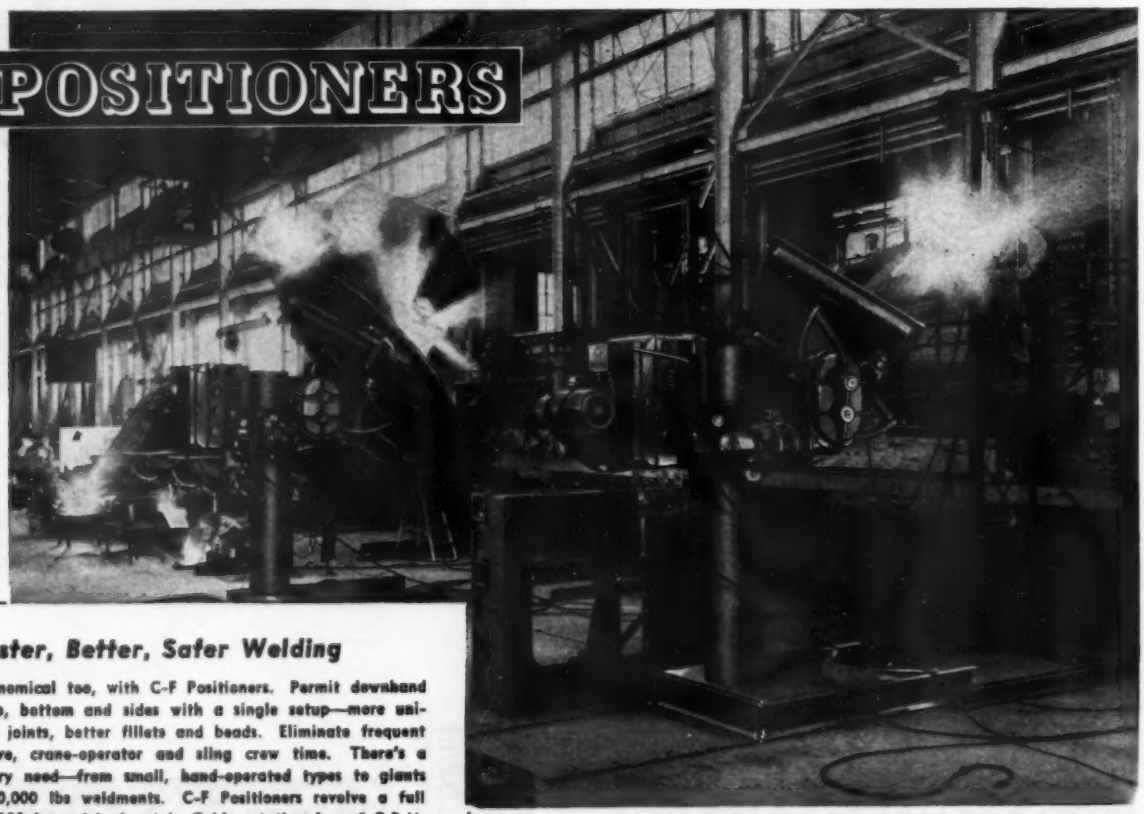

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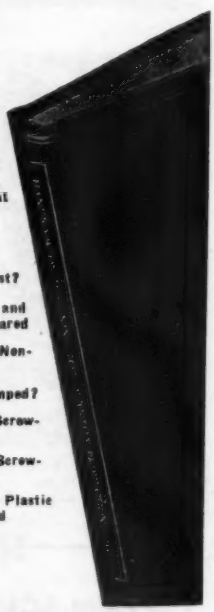

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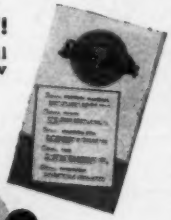

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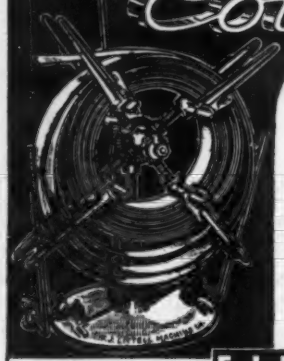

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LABOR

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(Note: You've read this message. If it doesn't apply to you please see that it reaches the *one* person who can put it in action!)

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2. Regular Payroll Savings deductions made during the drive accounting period will be credited toward the plant quota.
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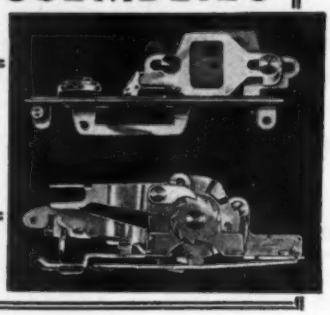

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P-865, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

ASSISTANT WORKS MANAGER WANTED

Assistant Works Manager wanted for a Diesel engine plant employing approximately 2000 men.

In addition to broad shop experience, must be skilled in handling all other problems including labor relations.

Those employed at their highest skills in war work will not be considered.

State experience and salary required.

Apply P-838, AMERICAN MACHINIST
330 WEST 42nd STREET NEW YORK 18, N. Y.

FACTORY CONTROL SYSTEMS, PERMANENT

Unusual opportunity with McCaskey Industrial Controls for production planning, scheduling, follow-up, costs, machine load, inventory, tool cribs, etc. See advertisement page 155. Our District Managers average more than ten years in present locations. Two established districts now open. Diversified production experience essential. Address details your qualifications to

McCASKEY REGISTER COMPANY
101 West 31st Street, New York (1)

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

A LEADING OKLAHOMA manufacturer of oilfield equipment desires to employ a man in the manufacturing department who is capable of handling time studies, work routing, scheduling, and dispatching production. Address applications to M. G. McCool, American Iron & Machine Works Company, Oklahoma City, Oklahoma.

INDUSTRIAL ENGINEER. Old established machinery builder, modern plant, equipment; permanent, advancement; post war opportunity. Give particulars. P-859, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SUPERINTENDENT WANTED: By a large, old-established Ohio plant manufacturing tools, jigs, fixtures, and special machinery. Plant is modern and well equipped. This is a permanent position with opportunity for an aggressive outstanding man with ability, and expert mechanical judgment for deciding all problems, salary attractive. Write for interview stating experience, background and when available. P-861, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED BY FOUNDRY group. An experienced man in job rating, time and motion studies, and wage incentive plans. Good salary paid to the right man. State age, experience and salary required. P-860, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details, R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo, N. Y.

POSITIONS WANTED

PERMANENT POSITION wanted as an assistant to a busy executive or as a factory manager by a 47-year-old, aggressive, mechanical engineer with excellent shop and organization experience and wide knowledge of production methods, processing and tool design. Position must afford plenty of responsibilities. Married, one son and able to locate on short notice. Record and references on request. Perfect knowledge of Russian, French and German languages. PW-806, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MANUFACTURING EXECUTIVE seeks new connection as Factory Manager or Executive Engineer with firm producing intricate mechanical-electrical devices. Experience includes 22 years with prominent business machine and industrial instrument companies. Proven record as good organizer and producer. PW-856, American Machinist, 68 Post Street, San Francisco, Cal.

TOOL AND PRODUCTION engineer, expert on tooling machinery and production methods. Aggressive, exceptional organizer and systematizer with 37 years experience. Precision work preferable. Position must be permanent. PW-857, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

ENGINEER: Graduate industrial, journeyman's papers in toolmaking. Desire executive position in war work with post-war future. Employed past three years as tool engineer in ordnance and aircraft work. Age 28, married, draft status 2B. PW-887, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

(Continued on Page 292)

(POSITION WANTED)

FOREMAN

Twenty years experience on Brown and Sharpe automatic screw machines. Able to design cams for these machines.

PW-866, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

ADDITIONAL EMPLOYMENT & BUSINESS OPPORTUNITY ADVERTISING ON PAGE 292

Do YOU KNOW THESE FACTS ABOUT THE USED MACHINE TOOL INDUSTRY ?

A $140,000,000 Market

In 1943, the annual turnover in used machine tools distributed by dealers was approximately 112,000 units, valued at about $140,000,000. (From figures compiled by the Research Council, Machinery Dealers' National Association).

A Soundly-Organized Marketing Mechanism

Thru mutual co-operation and interchange of Information, America's leading used machine tool dealers, associated in MDNA, are ready to function as the most economical, practical means of redistributing surplus tools back into post-war industry.

Established Many Years

The used machine tool market had its origin practically with the advent of the machine age. Some dealer organizations are now in the second or third generation of family ownership.

Merchant-Technicians

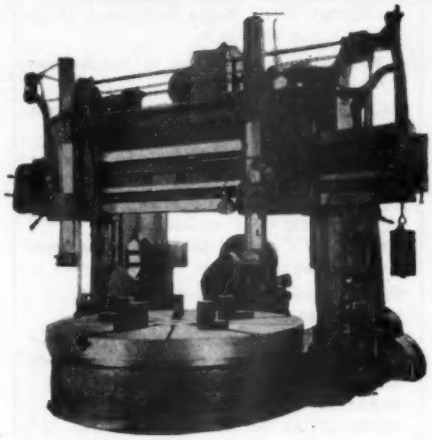
The successful used machine tool dealer must be more than a vender. In addition to knowing what, when and where to buy and sell, he must know the specific needs of his customers. Many MDNA dealers operate reconditioning plants which represent a substantial financial investment, and employ trained engineers and mechanics.

MDNA

MACHINERY DEALERS NATIONAL ASSOCIATION
20 N. WACKER DRIVE CHICAGO, ILLINOIS

IMMEDIATE DELIVERY

"FALK" for DEPENDABILITY in Rebuilt Machinery



100" Niles-Bement-Pond Boring and Turning Mill.

BORING MILLS

100" Niles-Bement-Pond Boring and Turning Mill.
Vertical, 48" Gisholt.
Vertical, 52" Colburn.
Vertical, 42" "New Era" Bullard.
Vertical, 60" Colburn.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".

COMPRESSORS

8 x 8 Bury Horizontal.
8 x 8 Sullivan.
6 x 8 Bury.

RADIAL DRILLS

4' Arm Cincinnati Bickford.
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cincinnati Bickford, air clamp.
7' Arm 15" Bickford.

MILLING MACHINES

No. 3 Cincinnati, High Power, Plain with Vert. Head & Rotary Table, M.D.
No. 5 Cincinnati, High Power, Plain, S.P.D.
No. 4 Cincinnati, High Power, Plain, S.P.D. (2).
No. 3 Cincinnati, High Power, Vertical.
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.

MILLING MACHINES (Con't.)

No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2).
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
No. 00 Bickett and Miller.
No. 0 Bickett Vertical Bench Miller.
Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24"
No. 8 Lees Bradner Thread Miller.
#40-H Index Universal Vertical Mill, like new.

No. 3 Cincinnati High Power, Vertical.
1—Brown & Sharpe #2 Vertical Miller, single pulley drive.

ANGLE BENDING ROLL

Bertsch 3" x 3" x ⅜".

PLANERS

120" x 72" x 35' Betts, 4 Heads, M.D.*
72" x 72" x 18' Pond Heavy Pattern, 4 Heads.
48" x 48" x 12' Putnam Heavy, 2 Hds., M.D.
30"x 30" x 12' American M.D., 2 Heads.
30" x 30" x 10' Cincinnati Heavy Pattern, 2 Hds.

PLANER - SHAPER

20" x 20" x 36" Niles-Bement-Pond, M.D.

BRAKE

203 Dries & Krump Apron Type, Motor Dr., 10' x 11 Ga.

SHAPERS AND GEAR CUTTERS

16" Queen City M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
28" Cincinnati Triple Geared Belt. Dr.
812 Fellows 36" Gear Shapers, (2)
14" Steptoe, M.D.
12" Schuchart & Schutte Gear Hobber.

GRINDERS

16" Heald Rotary Surface Grinder.
12" Persons-Arter Rotary Surface Grinder.
12" Heald Rotary Surface Grinder also equipped with 9" Dia. Permanent Magnetic chuck.
2 Cincinnati Centerless Grinder, Filmatic.
12 Greenfield Hydraulic Internal Grinder.
#1½ Cincinnati Universal Tool & Cutter Grinder, Motorized.

AUTOMATICS

Davenport Model "B" High Speed, 5 spindle 9/16" cap. Threading spindle, complete, perfect condition.
#0 Brown & Sharpe full Automatic Motorized, serial 5721.
Cleveland Model "A" 2" Cap. Belt. Dr. Oval Pan, good cond. $800.00.
Cleveland Model "A" ⅞" Cap. Motorized Countershaft, full equipment, Oval Pan, serial 11000, good cond. $700.00.
Brown & Sharpe #0 full automatics with plotting attachments (2).

LATHES

Monarch 16" x 8' Q. C. G. with Taper Attachment and Chuck.
South Bend 16" x 6' Motorized Gap Lathe.
Rockford "Sunstrand" Tool Room Lathe, 16" x 6' complete, Motorized, Collets, Taper att, Chuck, etc.
LeBlond 21" x 16' High Duty, Taper, Chuck, M.D.
Schumaker & Boye 20" x 10' QCG**, Taper, Chuck, Belt Dr.
Putnam 26 x 12 Heavy QCG, arr. for M.D.
South Bend 13" x 6' Motorized, Pl. Chge Gear; Complete.
South Bend 13" x 5' Motorized, Pl. Chnge Gear; Complete.
Seneca Falls 12" x 5' Belt Dr. Pl. Change, "Star Lathe."

MISCELLANEOUS

High Lift Truck, Platform type, Lakewood 4000# Capacity; Less Batteries. Lacquer Heater, J. C. Miller Co. with Acquastat. Heat Treating Furnaces for the Tool Room, all sizes. Multiple Spindle Drills; 54 Spindle Fox Hydraulic #15H; Multiple Spindle Drill; 24 Spindle Fox #D31, Motor Dr. Weigel 28" Upright Drill, sliding Head, Tapping Att. Power Feed; Superior 26" Upright Drill, Sliding Head, Tapping Att. BG&PF. Wire Coiling Machines for making BX cable, Sleeper & Hartley #1-50KW Moesta Gun Welder Transformer, portable, 25 cycle, 440 volts. Grinding wheels for #2 Centerless 4" face, 20" Diam.

Headquarters for Punch Presses

THIS IS A PARTIAL LISTING OF OUR STOCK. SEVERAL HUNDRED ADDITIONAL ITEMS IN STOCK. SEND US YOUR INQUIRIES.

**Quick change gear

*Motor Driven

Buy from Stock

FALK MACHINERY CO.,

18 WARD ST. MERCHANTS ROCHESTER 5, N.Y.

Tel. Main 6347-6348

KEEP 'EM RUNNING!

Every machine listed in this column is in our warehouse at press time.

36" BULLARD Vertical Turret Lathe
42" N.B.P. Car Wheel Borer
66" NILES-BEMENT-POND Boring and Turning Mills, M.D.
#0 FOSDICK Horizontal Boring, Drilling & Milling Machine, M.D.
4' HAMMOND Hi-Speed Sensitive Radial Drill, M.D.
33" x 9" GOULD & EBERHARDT Spur Gear Cutter
No. 6 BROWN & SHARPE Spur Gear Cutter
3' WESTERN Plain Radial Drill
7' AMERICAN Universal Radial Drill, M.D.
18/27" Gap Bed Lathes, M.D.
42" PUTNAM Double End Car Wheel Lathe, M.D.
#3-B MILWAUKEE Plain Miller
#2 CLEVELAND Plain Miller
#10 NILES Vertical Milling Machines
30"x30"x10' NEWTON Slab Miller
12" Wm. SELLERS Slotters
20" SELLERS Crank Slotter, M.D.
12"x12" ACME Power Hack Saw, M.D.
48"x48"x24' N.B.P. Heavy Planer, Two Rail, One Side Head, M.D.
48"x48"x20' PATCH Planer, 4 heads, 230 volt D.C. Rev. M.D.
24"x24"6' WHITCOMB Planer, 230 volt D.C. Reversing M.D.
42"x48"x12' SIMMONS Openside Planer, 230 volt D.C.
4"x4" capacity ALLIGATOR Shear, Low Knife, M.D. 24" Blade.
#1 L&A Multiple Punch, 100 Tone, 72" between housings
6"x6⅝"SOUTHWARK Double Angle Shear
SCHULTZ - NAUMANN Beam Shear, 20", 60 lb. and smaller
60" Throat, 8" x 1 1/16 LONG & ALSTATTER Shear
54" Throat 1¾"x1⅛" HILLES & JONES Punch
42" Throat, 1¾"x1" HILLES & JONES Punch, M.D.
4" LANDIS Pipe Threading Machine
6" BIGNALL-KEELER Improved Pipe Machine
10" STANDARD Pipe Threading Machine
4" BAKER Heavy Duty Automatic Tapping Machine

SIMMONS ENGINEERED REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 North Broadway, Albany 1, N.Y.
N. Y. Office: 50 East 42nd St.

EASTERN OFFERS FROM STOCK

GEAR CUTTERS & HOBBERS

No. 3 Barber-Colman, m.d.
No. 12 Barber-Colman Double Overarm, m.d.
No. Type A Barber-Colman, m.d., latest type
No. 3-26" Cincinnati Spur Gear Cutters
Cincinnati Gear Burnisher, m.d.
No. 3-26", 3-36", 3 Heavy, No. 4-36", 4-48", 6-60", 6-72" Brown & Sharpe Automatic Spur Gear Cutters
48" Cleveland Gear Hobber
No. 72 Fellows H.S. Gear Shaper, m.d.
Gleason Spiral Bevel Gear Rougher
Gear Testing Machine, belt drive
11" Gleason Straight Bevel Gear Generator, m.d.
Cross Gear Tooth Rounder, belt
Cross Gear Tooth Rounder, m.d.
30" Brainerd Gear Cutter, belt

CYLINDRICAL GRINDERS

6x18" Landis Plain, m.d.
6x32" Norton Plain, m.d.
10x48" Brown & Sharpe Plain, m.d.
10x52" Landis Plain, m.d.
10x72" Landis Plain, m.d.
10x96" Landis Type C Plain Hydraulic, m.d., latest type
12x36" Cincinnati Plain, belt
12x36" Modern Plain, m.d.
12x42" Landis Plain, belt
12x48" Cincinnati Plain, 3 motor drive
12x48" Modern Plain, belt
20x120" Landis Plain, m.d., with 36" gap
26x96" Landis Plain, m.d.
16x72" Landis Plain, m.d.
16x40" Landis Universal, m.d.
16x72" Landis Universal, belt

CYLINDER GRINDERS

No. 50 Heald, m.d., hydraulic
No. 55, 60, 65 Heald

VALVE SEAT GRINDER

Cincinnati Valve Seat Grinder, m.d., cap ⅜" valve stems, centerless type

HORIZONTAL DRILLS

No. 00S Garvin Duplex
Love Bros., m.d., No. 4 Taper
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic
6 spindle National Acme, belt
8 spindle Hammond, m.d., hydaulic

RADIAL DRILLS

2' American Triple Geared, m.d.
3' American Sensitive, belt
3' Bickford Plain, cone
3' Cincinnati-Bickford Plain, m.d.
3' Fosdick Sensitive, s.p.d.
3' Western Plain, m.d.
3½' Cincinnati-Bickford Plain, m.d.
4' Cincinnati-Bickford Plain, m.d.
4' Niles-Bement-Pond Semi-Universal, m.d.
4' Western Plain, m.d.
5' American Triple Geared Plain, gear box
5'-17" column Cincinnati-Bickford Super-Service Plain, m.d. on arm, fully inclosed head
5' Niles-Bement-Pond Full Universal, m.d.
5' Prentice Plain, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.
6' Reed-Prentice Standard, m.d.
7' American Triple Purpose Plain, 16" col., m.d. on arm, fuly inclosed head

UPRIGHT DRILLS

20" Cincinnati m.d.
22" Barnes All Geared Self-Oiling
24" Cincinnati
24" Hoefer
21" Weigel, m.d.
24" Sibley, m.d.
No. 310 Baker Bros. H.D., m.d.

More than 1,000 machines in stock for prompt shipment.

The EASTERN MACHINERY CO
1004 TENNESSEE AVE
CINCINNATI 29, OHIO

MOREY
Dependable Used Machines

DEFIANCE No. 25A Horiz. Boring Mill, 3¾" bar—Built in 1941
BULLARD 24" R.P. Vert. Turret Lathe
Le BLOND 17"x8' Rapid Production Lathe with turret att.—M.D.
N.B.P. 48"x36"x14' Planer; 3 heads; box table; belt drive
GRAY 72"x48"x12' Planer—two heads; belt drive
HAMILTON 42"x42"x20' Planer; 3 heads; DC motor drive
LUCAS 3" bar Horiz. Boring Mill, M.D.
LEES BRADNER #6 Thread Miller
AMERICAN 5' Radial Drill—motor on arm; triple purpose
NATCO C-13 Hyd. Mult. Spindle Drill
LANDIS 20"x220" Plain Grinder; M.D.
LANDIS #3½ Int. Hydraulic Race Grinder
DIAMOND #4 Surface Grinder; Hyd. Feeds
HEALD #60 Internal Grinder; M.D.
GLEASON 6"-18" Bevel Gear Generators
ESPEN LUCAS No. 150 Cold Saw—Cap. 12"
SAUNDERS 8"-16" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancing Machine
100 Ton Horiz. Hydraulic Forcing Press
CINCINNATI Gear Burnisher; M.D.
GOULD & EBERHARDT 24" Shaper—M.D.
LYND FARQUHAR 26" Planer Type Shaper

THIS IS A PARTIAL LIST
Send us your specific inquiries

MOREY MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

OTT MACHINERY SPECIALS

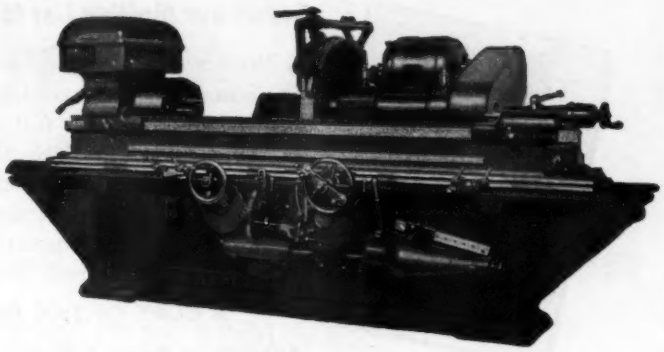
AUTOMATICS, Acme, Model C—9/16" M.D.
AUTOMATICS, Gridley, 9/16" & ⅝" Model G
AUTOMATICS, Gridley, 2¼, 3¼ & 4¼" S.S.
AUTOMATICS, Cleveland, 1¼, 1½, 2¾ & 3¾"
AUTOMATICS, Cleveland, ⅝, 1¼ & 2½" Mod. B
AUTOMATICS, Cleveland ⅝, 1¼ & 1½" Mod. M
AUTOMATICS, Cone 2¼", 4 spdles, M.D.
AUTOMATICS, New Britain #22 M.D.
AUTOMATICS, Potter & Johnston #5a & 6A
DRILLS, Baker Heavy Duty, #5 M.T.
GEAR HOBBERS, #3 & 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
GRINDER, Blanchard #16A Rotary Surface, 80" x18" Magnetic Chuck
GRINDER, Brown & Sharpe #10 & 12 M.D.
GRINDERS, Cincinnati 12" x 18" Plunge Cut
LATHES, 16"x8 Reed-Prentice G.H. M.D.
LATHES, Warner & Swasey #2, 4, & 6, M.D.
MILLING MACHINES, Becker Vertical Model S. D. 40" Rotary Table
MILLING MACHINES, Becker Vertical #5 & 6
PLANER, Ohio 42" x 42" x 12' One Head, M.D.

OTT MACHINERY SALES, INC.
542 Second Avenue
Detroit 26, Mich.
MONA

HILL-CLARKE

Modernized

CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



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10x36	14x36	16x50
10x50	14x50	18x96
10x72	14x72	18x168

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD **CHICAGO 6, ILL.**

GEAR MACHINERY

9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
Cimatool Gear Chamfering Mach., M.D.
Lees-Bradner Gear Grinder

SHAPERS—PLANERS

18"x18"x 4' Whitcomb Planer
36"x36"x 8' Woodward & Powell Planer, Rev. M.D.
36"x48"x12' Cinc. Hypro. Planer, 4 hds.

MILLERS

4¼"x12" Pratt & Whitney Thread Millers
Model L. T. 6"x36" Lees-Bradner thread miller, latest type
No. 25-B Defiance Hor. Bor. Mill 3¾" bar, New 1941
No. 1—12" and 1—18" Cincinnati Plain Automatic millers, latest type (19)
No. 2 Cincinnati Vertical Miller, Dial Type (11)
No. 2-3-4 Plain & Vertical Cincinnati High Power Millers, M.D.
New No. 3 Wigglesworth

GRINDERS

16"x216" Landis Pl. Grinder—latest type
No. 35 Gallmeyer & Livingston Hydraulic Surface grinders, latest type (6)
10"x120" Norton Type C Grinder—latest type
10"x120" Norton Pl. Grinder, M.D.
12"x120" Landis Pl. M.D.
No. 10 B & S Plain Grinder, M.D.
No. 3 Oesterlein C & T Grinder

LATHES—TURRET LATHES

6"x6¾" Gess & DeLeeuw Chucking Machine
1⅜" 4-spdle. Model G Gridley, M.D.
2½" Cleveland Model A
No. 3A Warner & Swasey 4½" Bar stock late type

MISCELLANEOUS

No. 21-8A Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Sprue Cutter
New Delta Drilling Equipment

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge 41, Mass.

MILES' QUALITY TOOLS

Air Compressor, 245' Ingersoll Rand
Air Compressor, 1400' Sullivan
Automatic, 4½" Gridley "H" 4 spdl. chucking
Automatic, 7" Baird 6 spdl. chucking
Brake, 10' x 10 ga. Dreis & Krump leaf
Balancer, Micropoise flywheel
Balancer, 44" Norton
Broach, No. 3, J. N. Lapointe double
Die Casting Machine, AC Spark Plug Co.
Drill, 3½' American radial
Drill, No. 430 Barnes two way
Drill, 20" & 21" Cincinnati Bickford
Drill, with tapping attmt. 25" Weigel
Drill, Nos. 2 & 3 Henry Wright sens.
Drill, Nos. 11, 12 & 13 Natco multiple
Drill, Barnes 2 way, 12" x 48" capacity
Furnace, Lindberg pot type
Furnace, Surface Combustion drawing
Gear Hobber, 16HS Gould & Eberhardt
Gear Hobber, No. 1 Lees Bradner
Gear Lapper, 8" Red Ring
Gear Generator, 15" Gleason spiral bevel
Gear Tester & Lapper, 18" Gleason bevel
Gear Chamferers, Peerless & Lipe
Gear Cutters, 36" & 48" Brown & Sharpe
Grinder, 12" x 36", 16" x 36", 16" x 52" Landis
Grinder, 16" x 48" Landis crankpin
Grinder, No. 72 Heald auto. internal
Grinder, 20" Gardner semi-auto. disc.
Grinder, 8" x 24" Lasalle surface
Grinder, 12" x 24" Diamond surface
Grinder, 24" Cincinnati milling cutter
Honing Machine, No. 211 Barnes
Lapper, No. 10U Norton
Lathe, 18" x 8' Greaves Klusman QCG
Lathe, Turret, No. 3B Foster
Lathe, Turret, 26" Libby, 4½" or 7⅛" hole
Lathe, Turret, 36" Bullard vertical, Rap. Pro.
Mill, 42" Bullard vert., 1 plain, 1 turret head
Mill 3" Universal horiz. boring
Miller, No. 2 Van Norman duplex
Miller, No. 2 Brown & Sharpe vert.
Miller, No. 3 Reed Prentice vertical, high speed
Miller, 30" Newton cent. rotary
Miller, No. 1 Davis Thompson duplex
Miller, Type C Hall Planetary thread
Miller, Size 3 Turnmillers
Miller, Types 10 & 45 Productomatic
Miller, 48" Oesterlein tilted offset
Planer, 24" x 24" x 5' Gray
Planer, 36" x 36" x 16' Cleveland openside
Press, 660 ton Bliss coining
Press, No. 85½ A Bliss reducing
Press, 51", No. 8G84 Ferracute dbl. cr.
Press, 34", No. 174 Consol. gap dbl. cr.
Press, 28", No. 71 Swaine double crank
Press, No. 53 Toledo straight side
Press, No. 6 Waterbury Farrel openback
Press, No. 33 Consolidated arch frame
Press, No. 2 Standard screw type
Press, No. 796¼D Toledo toggle draw
Riveter, Nos 2A, 5½B & 7B High Speed
Roll, No. R60 Yoder fender crowning
Roll, Forging, No. 1 Ajax Evans
Scraper, Anderson electric
Screw Driver, No. 61AA Bodine
Screw Driver, Model C Detroit
Sprue Cutter, Model 1 Tessmer
Saws, 4", 7" & 8" Higley cold
Shear, 8" x 8" x 1" Long & Alstatter angle
Tester 22 lb. Tinius Olsen drop
Tester, 60,000 & 230,000 lb. Olsen torsion
Tapper, 1" Six spdl. National Nut
Tapper, Natco 1 & 2 way lead screw
Threader, ¾" Economy stud
Welder, 80 KVA Taylor Winfield butt
Welder, 7 KVA Winfield automatic spot

SEND FOR COMPLETE STOCK LIST

MILES MACHINERY CO., SAGINAW, MICH.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED

MDNA

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

4' Universal Radial Drill, B.D.
D-4 Colburn H. D. Drill, #5 M.T.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
12" x 32" Landis Universal Grinder.
3-AL Gisholt Turret Lathe, 6¼". M.D.
20"-24"-32" Shapers.
10' Bridgeport Knife Grinder.
36" Morton Draw Cut Shaper.
No. 3 Catlin Keyseater 23" x 2", M.D.

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

LARGE METAL PLANER

Niles 12' x 2' x 25' Double Housing Planer, Two Heads on Rail, Two Side Heads, Two-Section Bed, Arranged Motor Drive — AVAILABLE IMMEDIATELY.

ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY
2269 Woolworth Building New York 7, N. Y.

THIS FOLDER GIVES ANSWERS TO PRODUCTION PROBLEMS

Get on our Mailing List to Receive this Folder and Regular Stock Lists

We have just finished printing an illustrated folder to show you why you can buy with confidence from The O'Brien Machinery Company. We've crammed it full of pictures that tell, better than words, that O'Brien is no "desk broker!" We show you our plant, our warehouse, our rebuilding shops, the assembly and testing departments. And there are many pictures of the types of machine tools and the power plant equipment that we rebuild, test and guarantee together with current lists of tools and equipment available.

A COPY OF THIS FOLDER WILL BE SENT YOU ON REQUEST.

Everything From A Pulley To A Powerhouse

Warehouses and Shops
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THE O'BRIEN MACHINERY CO.
PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS
113 NORTH THIRD STREET - - PHILADELPHIA 6, PENNA.

Bell Phone: MARKET 4180
Cable Address
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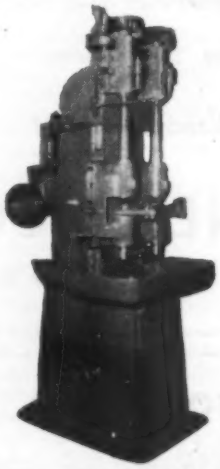

COULTER TWO SPINDLE BORING MACHINES:

Diameter of spindles 2⅜"
Maximum spindle centers 13"; minimum 9½"
Stroke of head 2"
Arranged for Motor Drive in base and equipped with 3 H.P., 3 phase, 60 cycle, 200 volt, 1200 R.P.M. General Electric Motor
With Square D starting Switch

(Three available in stock)

IMMEDIATE DELIVERY

Emerman Machinery Corp.
875 W. 120th St., Chicago 43, Ill.

FOR SALE

Following equipment of latest type purchased within two years, in first class condition and available for inspection:

Standard Barber—Colman Type "A" Hobbing Machine, Serial ☰1394, equipped with 550 volt 60 cycle 3 phase AC Electrical equipment.

3VG Reed-Prentice Vertical Milling Machine. Serial ☰20697, equipped with 3 HP, 550 volt 60 cycle, 3 phase 1200 RPM motor and control AC.

1—Anderson Brothers Power Scraper. Serial ☰6736, equipped with ¼ HP 110 volt 60 cycle single phase motor AC.

Type "EN-2" Pangborn Suction Feed Blast Cleaning Cabinet. Serial No.53EN2-42309. Blast compartment 4'10" long x 2'9" wide x 2' x 10" high, maximum size of work 31"x22", equipped with lifting type counterweighted door at each end, electric light fixtures, sight opening, work openings equipped with operator's sleeves and gloves, also counterweighted movable suction feed blast gun fitted with 7/32" air jet and ½" cast iron nozzles.

Delta ☰1555—4-17" Spindle Drill with ☰2 Spindles, equipped with eight ¾ HP 550v 3 phase 60 cycle AC motors.

☰645 Fellows Gear Shaper with Spur Guide and 2" Raise. Serial ☰19203. Equipped with GE Type K motor drive, Frame ☰225, 3 HP 3 Phase 60 cycle, 550 volt 1800 RPM AC.

☰13 LS Fellows Gear Lapping Machine with work support. Serial ☰18557. Arranged for motor drive ½ HP GE 1725 RPM AC motor.

☰50 Ex-Cell-O Precision Thread Grinder—Wheel Drive. Serial ☰6021—with gears for 30 pitches 2-28, table extension for work up to 115" between centers, capacity 3" dia. Elect. Equip. and switches 550 volt 60 cycle 3 phase AC Direct Conn. Motor on pump.

Detroit Rex Degreaser VS 8506, Gas Fired. Serial ☰4466. Equipped with starting switch with 1¼ HP 1750 RPM 110 volt 1 phase 60 cycle AC motor.

Apply for further particulars.

REED-PRENTICE CORP.
WORCESTER 4, MASS.

AUTOMATICS:— B&S ☰00
BORING MILL:—Bertram 42".
Brosch-LaPointe ☰4W Hyd.
DRILLS:—Niles 7' Radial
Cincinnati-Bickford 5', 6' Radials
GRINDERS:—Norton 6x32, 10x24, 18x90
Baxter D. Whitney ☰23 Cylinder Grinder, Like New
Brown & Sharpe ☰11 Plain
Brown & Sharpe 3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Bryant ☰18 Hole; Bryant ☰3B, 6, 12 Internal
P & W 14" B.B. Vert. Surface
Farrel Roll Grinder
LATHES:—Lodge & Shipley 20"x8' Selective G.H.
Johnson 30"x24'
Wicken 32"x14' Cone, M.D.
Le Swing 4"x60', 3½"x108"
J & L 2¼x24, 3x36 Flat Turret
MILLERS:—Cin. ☰3, 4 Plain SPD
Becker ☰4B Vertical; Milw. ☰1½ B Vert.
Cin. ☰4 Vertical SPD
B&S ☰3 Vertical SPD
Rowbottom Cam Miller
P&W 8" Automatic
Pratt & Whitney 12" Heavy Auto.
Pratt & Whitney 2" Spline Duplex
Pratt & Whitney 4½"x12", 6"x48", 6"x72" Thread Millers
Hanson-Whitney Thread Miller
Pratt & Whitney Gun Barrel Drillers, Reamers, Rifflers and Chamferers.
Cincinnati 12" B.G. Mfg.
Becker ☰7H Lincoln
PLANERS:—Cincinnati, 30"x30"x10'; 36"x36"x20' Gray 36"x36"x10' 4 Head Planer; Gray 42x42x12 Cin. 46"x48x20', 3 Head
Fitchburg 72"x50"x20', 4 Head
Gray 84"x72"x18', 4 Head
PRESSES:—Z & H ☰18 Percussion
Ferracute ☰DGGF36 Double Geared
108 Ton Cap. 36" stroke, Weight 36000 lbs. New 1939

BOTWINIK BROTHERS, INC.
373 Welton Street
New Haven, Conn.

MACHINE TOOLS

Excellent condition!

No. 4 Portage Horizontal Boring, Drilling & Milling Machine
5' American Plain Radial Drill
Thompson Universal Grinder, 12" x 30"
3⅞" Niles Bement Pond horizontal Boring Bar
20" Wolcott Backgeared Crank Shaper
ALL MOTOR DRIVEN
(Write for complete detailed specifications!)

Iron & Steel Products, Inc.
13498 S. Brainard Ave., Chicago, Ill.
"Anything containing IRON or STEEL"

MISCELLANEOUS MACHINES

48"x36"x16' Gray Dbl. Housing Planer, 3hds., 15 HP, A.C. m.d.
48"x48"x14' Gray Dbl. Housing Spur Grd. Planer with 4 hds., incl. 25 HP, A.C. motor.
12"x18" Cinci. Plunge Cut Grinder, A.C. m.d., 20x8" face wheel, rebuilt.
3¼" bar Morris Horiz. Boring Mill, m.d. with 4 bars.
6' Niles Pl. Radial Drill, A.C., m.d., Rebuilt.

STRONG, CARLISLE & HAMMOND CO.
1392 West 3rd St., Cleveland, Ohio
2832 E. Grand Blvd., Detroit, Michigan

SEARCHLIGHT SECTION

(Classified Advertising)

Employment • Business Equipment

(Used or Surplus New)

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UNDISPLAYED RATE:

10c a word, minimum charge $2.00; Positions Wanted (full or part-time salaried employment only) ½ the above rate. Undisplayed style: not available for equipment advertising.

DISPLAYED RATE:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

LATEST TYPE

GEAR CUTTING and THREAD MILLING MACHINES

BUILT IN 1941 - 1942 — *Nearly New* — FULLY GUARANTEED

IMMEDIATE DELIVERIES — NO PRIORITIES REQUIRED!

7—BARBER COLMAN Type A Gear Hobbers

7—BARBER COLMAN No. 3 Precision Gear Hobbers

6—GLEASON 3" Bevel Gear Generators

3—PRATT & WHITNEY 4½"x12" Thread Millers—Model C

1—PRATT & WHITNEY 4½"x36" Thread Miller—Model C

ALL MOTOR DRIVEN AND INCLUDING 3 phase, 60 cycle, 220 volt A.C. motors

MOREY MACHINERY CO., Inc.

410 BROOME STREET — NEW YORK, N. Y.

No. 5 Cincinnati Plain Mill, S.P.D.
18" Libby, 5" hole in spindle, M.D.
Hardinge Precision Optical Lathes, M.D.

MONA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N.Y.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

MONA MEMBER

B. D. BROOKS, INC.
361 Atlantic Ave., Boston, Mass.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DEWITT TOOL COMPANY
173 Grand St. — New York City

UNUSUAL VALUES

Belt Cutter 1" capacity 3 spindle
Brake Robinson 5' toggle
Brake, Chicago steel, 3'
Compressor, 120 Schramm, portable
Drill, near 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Press, 20" three spindle Barnes
Drill, six-spindle Henry & Wright, 12" overhang
Drill, two-spindle sensitive, #1 Morse taper
Grinder, #20 Bryant deep hole internal
Grinder, Sellers Tool
Grinder, 60" knife
Hammer, 30# Bradley upright, helve
Lathe, 24" x 18' Steptoe-McFarlan
Pipe Machine, 8" Oster motor drive
Press, #8-7 Zah-Hahnemann straight side grd.
Press, #1 open back inclinable, motor drive
Punch & Sheer, two ½" capacity
Threading Machine, #0 Webster & Perks
Turret Lathe, L & D brass, cross slide turret
Vacuum Cleaners, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

FOR IMMEDIATE DELIVERY— PRACTICALLY NEW AND REBUILT

BORING MILLS
24", 36", 42" and 54" Bullard and Cincinnati. Late type.

MILLING MACHINES
No. 1, No. 2, No. 3, No. 4, No. 5 Vertical and Horizontal. Cincinnati, Kearney & Trecker and Brown & Sharpe.

TURRET LATHES
No. 1A, No. 2A, No. 3A, No. 4 and No. 6. Warner & Swasey.

LATHES
14", 16", 18", 20", 24", 30", 36" up to 66". American, Leblond, Hendey, etc.

PLANERS
36"x36"x16' D&H M.D. Open Side.
20"x20"x6' Ames.
48"x48"x18' Putnam, M.D.
48"x48"x14' Cleveland M.D. Open Side, Box Table.

RADIAL DRILLS
5' and 6' Bickford.
5' Carlton, 17" column. Latest Model.
4' Carlton.

SHAPERS
14", 16", 18", 20", 24", 28" Gould & Eberhardt, Smith & Mills, etc.

GRINDERS
Internal and External. Many sizes.

S & S MACHINERY COMPANY

207 CENTRE STREET — Telephone: WOrth 4-5710 — NEW YORK 13, N. Y.

SELL YOUR SURPLUS EQUIPMENT

IT IS NEEDED TO SPEED THE WAR'S END

DSP INC. ORGANIZATIONS

We have a demand for your surplus and idle equipment—a single item or a complete plant. Send us your list of such equipment—and put it to work where it is needed most.

WE PURCHASE ON A CASH BASIS

DULIEN STEEL PRODUCTS, INC.

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200 NATIONAL BLDG.	11611 SO. ALAMEDA	2280 WOOLWORTH BLDG.
SEATTLE 4, WASH.	LOS ANGELES 2, CALIF.	NEW YORK 7, N. Y.

WANTED

3B PRATT & WHITNEY JIG BORER

Not over 5 years old
With or without additional accessories
Address: W-854, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

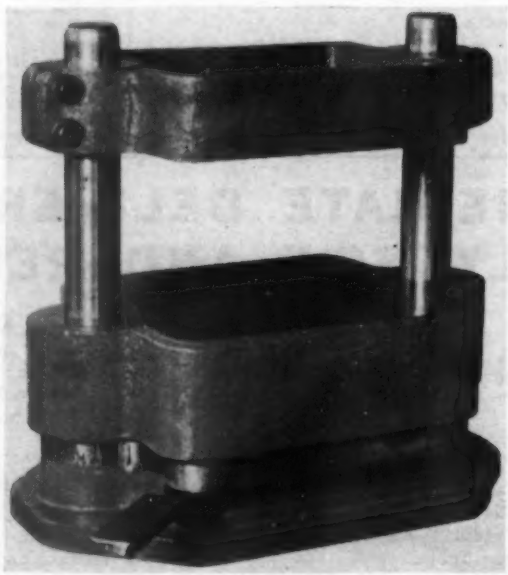
EXCLUSIVE

Manufacturing Rights

FOR SALE

On PATENTED

Universal Drill Jig



Further information on request

JOSEPH S. PECKER, 200 Madison Avenue, New York 16, N. Y.

POSITIONS WANTED

(*Continued from page 285*)

TOOL SUPERVISOR available; will cut costs, solve manufacturing difficulties, simple, effective tools. PW-829, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FOREMAN, INSTRUCTOR, toolmaker, machinist with years of experience in personnel and taking charge of all makes of turret lathes and Cleveland automatics, seeks position with post-war possibilities. Will procure release. PW-869, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PLANT MANAGER: Engineering graduate, age 36, now superintendent and with 15 years industrial engineering background seeking to assist in management of plant whose war time and postwar plans require smooth introduction of practical production and cost controls. Experienced from both line and staff end in incentive wage payment, cost reduction, budgetary control of expense, product planning, coordination and control of development of new products. Detailed record of experience on request. PW-870, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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OFFERED—WANTED
Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY OFFERED

MANUFACTURER'S REPRESENTATIVE wanted by a midwestern manufacturer of metal stampings in small lots. Some very desirable territory still open on a protected commission basis. Die stamping knowledge an advantage. Reply Room 209, 549 Washington Boulevard, Chicago, Illinois.

PATENT ATTORNEY

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CONTRACT WORK

MANUFACTURING FACILITIES WANTED: Forging, cold heading or punch press shop wanted to make several million pocket knife bolsters for us. Write for samples. Union Cutlery Co., Inc., Olean, New York.

WANTED

MACHINE AND TOOL SALESMEN

EXCEPTIONAL OPPORTUNITY FOR HIGH GRADE EXPERIENCED MEN TO EXPAND INCOMES HANDLING HIGH QUALITY WELL KNOWN CUTTING OILS AND LUBRICANTS IN ADDITION TO THEIR OWN LINES. ATTRACTIVE COMMISSION. *WRITE COMPLETE DETAILS.*

SW-867, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

STEEL BLDG.

176' x 360'

HAS 2 — 65' CRANE RUNWAYS

WILL SELL ALL OR PART

LIBERTY INDUSTRIAL SALVAGE

1500 River Avenue, Pittsburgh, Pa.

GRINDERS

Lees Bradner Gear Grinder.
Simplicity Piston Grinder.
12" x 96" Landis Plain, S.C.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#6 Fellows Gear Shaper, Cone.
#3 Adams Farwell Gear Hobber.
#2 Pfauter Gear Hobber.
#18H Gould & Eberhardt Gear Hobber.

PLANERS

42" x 42" x 20' Cincinnati Hypro, 4 Heads, D.C. drill.
72" x 60" x 28' Pond 2 heads, Belt drive.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodward & Powell, 2 Hds.

RADIAL DRILLS

2½' American Plain, M.D.
3' American Sensitive.
3' Cincinnati Bickford Plain Radial Drill. 4 Spindle Sipp, Power Feeds.

LATHES

18" x 8' Lodge & Shipley, 3 S.C.D. D.B.G.
22" x 10' LeBlond 3 S.C.D. Q.C.
26" x 15' Pittsburgh, 3 S.C.D. Q.C.
20" x 8' Sebastian Geared Head, S.P.D.
36" x 18' Schumacher & Boye 5 S.C.D. Trip Grd.

MISCELLANEOUS

14" Niles Slotter.
#4 Cincinnati Vert. High Power Mill, M.D.
#2B Brown & Sharpe Plain Miller, S.P.D.
#2 Cincinnati H.P. Universal Miller, S.P.D.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St., Cincinnati, Ohio

Notice to Advertisers

Because of the Holiday, Independence Day, July 4th, the "Searchlight" pages of the

JULY 6th ISSUE OF

AMERICAN MACHINIST

Close for press earlier than the usual weekly closing time.

The cooperation of advertisers is solicited in forwarding new copy, or changes of copy, to reach us accordingly.

FINAL CLOSING TIME

Displayed and Undisplayed Ads: Wednesday 10 A.M., June 21st.

Air Compressor, 7x6" Ing-Rand, ER-1, 10 HP. Motor of 3/60/220 V., including Air Receiver.
Angle Bender, #14 Excelsior, 2"x2"x¼", MD.
Automatics, Cleveland, 1¼" & 2¼", SS., MD.
Bolt Threader, 2½" Acme, 35 sets of Dies
Boring Mill, 72" Colburn, 2-Hds, PRT., SPD.
Broaching Machine, #3 LaPointe-Hudson.
Drills, 2 & 4-spindle, #2 MT; belt or MD.
Drills, 25" & 36", S.H., Tapping Att.
Hack Saw, 13"x16" Peerless, gear box MD.
Hammers, 600 & 850 lbs. Bell, Single frame.
Lathe, 18"x10' American 3 step, B.D.G., Q.C.G. chuck
Lathe, 60"x20' New Haven, HS; Face plate drive
Miller, Univ. #3 Hendey, without index head.
Miller, Plain, #4-B. Brown & Sharpe, MD.
Millers, Vert. "C." & 4-B. Becker, MD.
Pipe Cut-Off Machines, 2" & 4" Murchey.
Planers, 28"x28"x10'; 38"x38"x9'; 48"x48"x14'.
Riveter, 2-A. High Speed, MD.
Roll, Forming, McKinney type 3-F., cap. 10 ga. to ¼".
Roll Lathe, 42"x20' United, necking & piano rests.
Screw Mach., #0 B. & S. Auto., cap. ½"x1¾", B.D.
Shear, Bar, United, cap. 8"x1", geared MD.
Turret Lathe, 2"x36" J. & L., 2-spindle, MD.
Turret Lathe, 2¼"x24" J. & L., B.F., MD.
Turret Lathe, #2 W. & S., BF., MD.
Turret Lathe, 24"x6¼" Gisholt, motorized.

GALBREATH MACHINERY CO.
306 Empire Bldg., Pittsburgh 22, Pa.

FOR SALE

2½" CLEVELAND 1943
MODEL A.
NEW CONDITION.

CONTINENTAL PISTON RING COMPANY
MEMPHIS TENNESSEE

FOR SALE
Coulter Diamond Boring Machine

Vertical, single spindle, complete with 5 HP, 440 volt, 3 phase drive with starter and work hold down—can finish bore holes up to 4" dia. by 3" deep. Machine ready to run.

THE OHIO ELECTRIC MFG. COMPANY
CLEVELAND, OHIO

FOR SALE

1—LeBlond Automatic Duplex Production Lathe front and rear carriage, hydraulic feeds, equipped with air cylinders and valves, 220-3-60.

2—John S. Barnes #8 automatic production lathe front and rear carriages, equipped with air cylinder and valves, 220-3-60.

JOHNSON BRONZE CO.
515 S. MILL ST., NEW CASTLE, PA.

Before you buy, sell or exchange machinery of any kind contact us first.

PAUL'S MOTOR & MACHINERY SUPPLY
6111 Vermont Ave
DETROIT, MICH

MONA MEMBER

CLOSEOUTS

BORING MILLS

VERTICAL

120" Niles
42" Bullard, turret head, swivel head
54", 62" Colburn, M.D.
36" Bullard V.T. L., side head
66" Niles-Bement-Pond

HORIZONTAL

2½" Universal, Binsee
4" Dietrich & Harvey Floor, M.D.
4" Binsee
4½" Bement-Niles

TURRET LATHES

26" Libby, 7½" hole
18" Libby, 3½" hole
24" Gisholt, 6½" hole
Foster No. 1B, M.D.
Foster Nos. 4, 5, 6
W. & S. Nos. 2, 4, Universal, M. D.
Gisholt Automatic, M.D.
J. & L. 2¼x24", 3¼x36"
Acme 3¼x36" grd. head
W. & S. No. 3A

GRINDERS

P. & W. 14", 18", B.B. vert., M.D.
Blanchard 26", 30" M.D.
Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 72A Internal, M.D.
Norton 50"x28', M.D.
Gardner 72". Disc, M.D.
No. 10 B. & S., M.D.

LATHES

48"x12' Harrington Gap Sld. Bed
McCabe 26-42"x14'
26"x24' Putnam 3 step cone, D.B.G.
24"x12' Boye & E. 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
16"x8' Lodge & S. Grd. hd., taper, M.D.
14"x6' Hendey tie bar, taper
14"x6' Mulliner, taper, collets

AUTOMATICS

Cleveland Model A, ½", ⅝", 1¼", 2"
Cleveland Model B, 1", 2"
Gridley 1¼", 2¼" 4 spindle
Cleveland ⅞" Model M, 4 spindle
Gridley 4¼", single spindle, M.D.
B. & S. Nos. 00 OG, 2G
P. & J. No. 6A, M.D.
New Britain, 1⅝" x 7", six spindle

SHAPERS

14" P. & W., M.D.
20" Stockbridge
20" G. & E., S.P.D.
26" Stockbridge, M.D.

GEAR CUTTERS

B. & S. Nos. 3-26", 4-36"
Gleason 11" Bevel
Pfauter No. 3 Gear Hobber, 59" cap.
No. 3 Barber-Colman Gear Hobbers

MILLING MACHINES

Providence Planer Type 32"x8'
Nos. 2, 3, 4, B. & S., and Cincinnati Plain & Univ.
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12 Profiler, M. D.
No. 2 Kent-Owens
Hall Planetary Thread Miller, Model D
No. OY B. & S., M.D.
No. 1Y B. & S., M.D.
B. & S. No. 12
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid traverse

RADIALS

4' American Triple Purpose
8' American Triple Purpose, M.D.
5' Dreses, Full Universal
3' Cincinnati-Bickford
2½' American
4' Mueller, M.D.
4', 5' Western, S.P.D.

MISCELLANEOUS

Pels 6' throat punch
P. & W. 6" Vert. shaper
Marvel Metal Band Saw, M.D.
McCabe ½" Flanger
Pipe Machines, 2", 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
No. 30 Natco Multiple Spindle Drill
Pottstown Tappers
150 ton United Steam Hammer
Hall Planetary Thread Miller
Rochester 5-C High Speed Hammer
Thompson-Gibbs Spot Welders 17 KVA
Anderson Tapper, No. 23A Quickwork Rotary Shear
Gorton No. 8D Vertical Miller, M.D.

AARON MACHINERY CO.
45 Crosby St.
New York 12, N. Y.

MONA MEMBER

Symbols of Freedom

Musket and Powder Horn, 1775 . . . the soldier who carried these in the revolutionary war helped make America free. Perhaps he loved freedom . . . although it is possible that he took up arms because of a recruiting poster of the period which promised: "A bounty of TWELVE dollars, together with SIXTY dollars a year in gold and silver on account of pay."

United States War Bonds, 1944 . . . purchase of these to the limit of your resources will help keep America free. If more than patriotism or love of freedom is needed, there is that "bounty" of TWENTY-FIVE dollars on every seventy-five dollars invested in the finest "securities" on the market today.

Allied Products Corporation and its divisions, Richard Brothers and Victor-Peninsular, in Detroit and Hillsdale, Michigan, are making precision parts for guns, airplane engines and other matériel of war. They also make the original, patented R-B interchangeable Punch and Die; sheet metal dies; plastic molds, jigs and fixtures, cold forged parts; and other special products. All four plants have now added a star to their Army-Navy "E" pennants.

ALLIED PRODUCTS CORPORATION
Executive Offices: 4646 Lawton Ave., Detroit 8, Michigan

5TH WAR LOAN

Let's All Back The Attack

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